

AD-A150 190

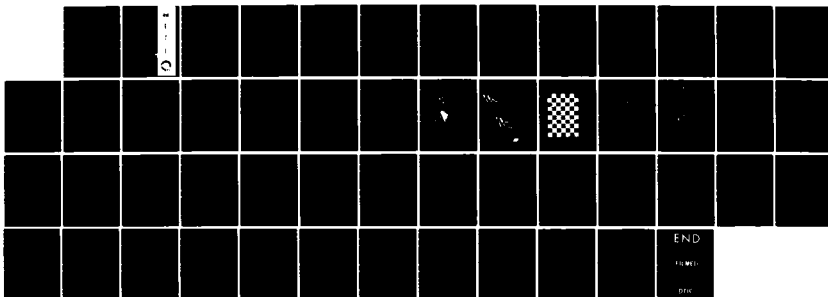
DIGITAL LASER PLATEMAKER MODIFICATIONS(U) TECHNOLOGY  
APPLICATIONS INC FALLS CHURCH VA DEC 84 ETL-0379  
DAAK70-83-C-0165

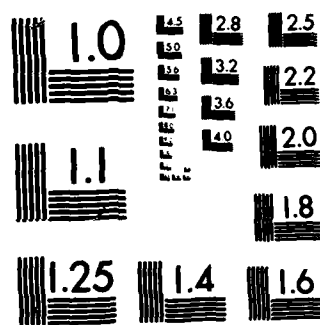
1/1

UNCLASSIFIED

F/G 14/5

NL





ETL-0379

AD-A150 190

## Digital laser platemaker modifications

Technology Applications, Inc.  
3 Skyline Place  
5201 Leesburg Pike  
Falls Church, Va. 22041

December 1984

DTIC FILE COPY

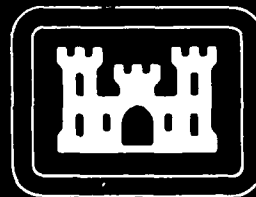
DTIC  
ELECTE  
JAN 25 1985  
S A D

Prepared for

US ARMY CORPS OF ENGINEERS  
ENGINEER TOPOGRAPHIC LABORATORIES  
FORT BELVOIR, VIRGINIA 22060-5546

APPROVED FOR PUBLIC RELEASE. DISTRIBUTION UNLIMITED

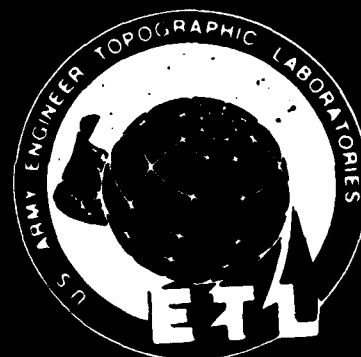
85 01 16 068



E

T

L



Destroy this report when no longer needed.  
Do not return it to the originator.

---



The findings in this report are not to be construed as an official  
Department of the Army position unless so designated by other  
authorized documents.

---

The citation in this report of trade names of commercially available  
products does not constitute official endorsement or approval of the  
use of such products.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0379	2. GOVT ACCESSION NO. AD-A150190	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) DIGITAL LASER PLATEMAKER MODIFICATIONS		5. TYPE OF REPORT & PERIOD COVERED Final Technical Report 10/83-9/84
7. AUTHOR(s)		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Technology Applications, Inc. 3 Skyline Place, 5201 Leesburg Pike Falls Church, VA 22041		8. CONTRACT OR GRANT NUMBER(s) DAAK70-83-C-0165
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060-5546		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE December 1984
		13. NUMBER OF PAGES 49
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)  Approved for public release; distribution is unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) background Graphic Arts, Lasers, Computers, Electronic Imaging.  comp. 1		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A series of investigations were conducted on the Army's digital laser plate- maker to identify and correct deficiencies and increase system overall operability. A new footbar was designed and installed which reduced media loading errors. Accuracy testing indicates that inter-image error is less than 0.002 <sup>inch</sup> , while intra-image error is not within tolerance. Testing results are encouraging that intra-image errors can be further reduced, but additional work is needed in the areas of accuracy testing and alignment of some of the  <sup>inch</sup>		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

→ Optical components. While the existing machine is functional, there are several areas where components should be redesigned for a production model.

*Originate - supplied keywords include: - → to front p.*

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

# PREFACE

This document was prepared under contract DAAK70-81-C-0165 for the U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Virginia, by Technology Applications, Inc., Falls Church, Virginia. The Contracting Officer's Representative was Mr. James P. Rogers II.

Accession For	
ADIS CRA&I	<input checked="" type="checkbox"/>
ADIS T&R	<input type="checkbox"/>
Unpublished	<input type="checkbox"/>
Justification	
Distribution/	
Availability Codes	
Dist	Avail and/or
A1	Special



## TABLE OF CONTENTS

	Page No.
1.0 INTRODUCTION .....	1
2.0 DISCUSSION OF LPM MODIFICATIONS .....	2
2.1 MEDIA LOADING SUBSYSTEM .....	2
2.2 ELECTRONIC REGISTRATION SUBSYSTEM .....	4
2.3 LASER AND OPTICAL SUBSYSTEM .....	5
2.3.1 LASER BEAM ALIGNMENT .....	5
2.3.2 SPINNING MIRROR ALIGNMENT .....	6
2.4 SCANNING SUBSYSTEM .....	6
2.4.1 FAST SCAN .....	7
2.4.2 SLOW SCAN .....	7
3.0 ACCURACY TESTING .....	8
3.1 TESTING PROCEDURE .....	8
3.2 DISCUSSION OF TESTING RESULTS .....	9
4.0 LPM SOFTWARE DOCUMENTATION .....	11
5.0 EVALUATIONS AND RECOMMENDATIONS .....	11
6.0 REFERENCES .....	13
APPENDIX A - DIGITAL LASER PLATEMAKER ACCURACY TESTING DATA .....	21

## LIST OF FIGURES

1. LARGE FORMAT DIGITAL LASER PLATEMAKER .....	14
2. MEDIA LOADING WITH DETAIL OF FOOTBAR .....	15
3. LPM CHECKERBOARD TEST IMAGE .....	16
4. LPM ACCURACY TESTING - TESTS 3,4, & 5: WIDTH OF COLUMNS .....	17
5. LPM ACCURACY TESTING - TESTS 3,4, & 5: WIDTH OF ROWS .....	18
6. LPM ACCURACY TESTING - TEST 6: WIDTH OF COLUMNS .....	19
7. LPM ACCURACY TESTING - TEST 6: WIDTH OF ROWS .....	20



## 1.0 INTRODUCTION

→ The Digital Laser Platemaker (LPM) is a high resolution, high accuracy system developed as a prototype to expose large format pressplate or film that is compatible with the Defense Mapping Agency lithographic production process. The LPM reads compressed digital data in raster format from magnetic tape. Through an electro-mechanical system, laser generated light is aimed and modulated to expose images on photosensitive media. Figure 1 shows the basic configuration of the LPM.

4/1473

After delivery to ETL it was found that the LPM was deficient in several areas which limited its use as a test bed and led to a general reputation of being unreliable. The objective of this study was to correct these deficiencies and enhance the LPM's operability. As work progressed on correcting known problems new problems became apparent which often required some redirection of efforts. While several problems were solved, additional work on the LPM needs to be done before it can become a fully functional machine to ETL. Areas where additional work is needed are identified throughout this report.

The two most time consuming problems which hampered efforts were consistent failures of the laser power supply, and the tape drives and formatter. The former was solved when a gasket in the plasma tube ruptured. Due to the high cost of replacement (\$15,000.00) of the gasket, the entire laser was replaced with a Lexel Model 95 Argon Ion Laser. To date, no problems have been experienced with this laser. (It should be noted that the Lexel Model 95 is not the optimum selection for the LPM.) Solving the second problem required several visits from the field service representative for the tape drives and formatter. It is believed that the problems have been remedied. However, regular service will probably be required to maintain these units in an operational status.

Other problem areas addressed during this study included media loading, electronic registration, and software documentation. Upon completion of modifications in these areas, tests were conducted to establish the LPM's accuracy. After initial testing some realignment of the optical subsystem was necessary. Unfortunately, completion of testing and alignment procedures

were not completed due to time constraints and reoccurring LPM breakdowns. However, preliminary results were encouraging that the LPM is capable of meeting lithographic accuracy requirements.

The following sections describe modifications made to the LPM and discuss its current status and capabilities.

## 2.0 DISCUSSION OF LPM MODIFICATIONS

There are three major subsystems of the LPM which were found to have deficiencies requiring modification. These included the Media Loading Subsystem, the Electronic Registration Subsystem, and the Optical/Laser Subsystem. The discussions that follow will address those deficiencies, and explain the modifications made to correct for them.

### 2.1 MEDIA LOADING SUBSYSTEM

The Media Loading Subsystem was found to be inadequate in its delivered configuration to properly perform its function of transporting and registering recording media into and out of the exposure drum. These inadequacies led to damage and skewing of the media while loading or unloading.

Deficiencies and subsequent corrective actions for the Media Loading Subsystem are described in the following.

- a) The flexible carrier with registration pins was removed due to its poor condition, i.e. it was kinked and stretched to the point of causing poor registration.
- b) The original footbar had flexible "footbar brackets" which were used in the clamping of the media to the footbar. It was found that while loading or unloading, these clips were rubbing on the inside surface of the drum causing abrasion. A new foot bar (see Figure 2) was designed which was identical to the original with the following exceptions.

The "footbar brackets" were replaced with stronger ones (see Figure 2) which would not deflect under pressure of the clamping feet, and would at no point touch the drum.

Two registration blocks were placed at either end of the footbar so that registration now takes place by butting the leading edge of the media against the foot bar, and aligning the top edge of the media with a mark on the loading table.

- c) It was found that the drive rings, which are used to move the footbar around the inside of the drum and thereby loading the media, were out of alignment. This problem was aggravated by the slip clutches installed on each gear driving each drive ring. This misalignment resulted in skewing of the footbar which in turn would skew the media upon loading. To remedy this problem the drive rings were realigned and the slip clutches were tightened to hold the drive rings in proper alignment.
- d) In the original configuration, the drive ring motor vacuum sequence was as follows: The drive rings would load the media into the drum and bang up against 2 stops at the end of their travel. Next the trailing edge of the media was clamped in place with the last segment of 6 vacuum ports. The drive rings would then reverse, expanding the media against the inside surface of the drum. The vacuum would then be applied to the remaining 5 ports in order from the trailing edge of the media to the leading edge (at the footbar).

After imaging, all of the vacuum parts would release, and the drive rings would reverse thereby unloading the media, and would again bang up against 2 stops at the end of their travel.

This sequence caused several problems. The first was that each time the drive rings would bang up against their stops the whole machine would vibrate, and the components in the drive trains would be stressed. The reversal of the drive rings after loading caused the registration hole in the media to be misaligned with the photo

detector (which is mounted on the outside surface of the drum) because the drive rings would not always reverse by the same amount on successive loadings. Lastly, with the vacuum first being applied to the trailing edge, the media was clamped at a point far removed from the area of registration, thereby allowing for misregistration.

To correct these problems the drive ring control sequence was modified to go to a slow speed 2" before the stops. The drive rings now gently hit the stops. The vacuum sequence was reversed and is now applied at the leading edge first and sequentially around to the trailing edge.

These modifications have resulted in a smoother operating Media Loading Subsystem with no damage to the media and consistent alignment of the registration hole with respect to the photo detector, insuring proper registration of the electronic registration subsystem.

## 2.2 ELECTRONIC REGISTRATION SUBSYSTEM

Initially, the electronic registration subsystem was inconsistent in its accuracy, and image placement was off by as much as 2" from the intended position. It was found that these errors were caused by misalignment of the drive rings, which was corrected by the alignment discussed in the previous section.

An X-registration display panel was installed on the LPM which enables the operator to monitor the position of an image on the medium within 1/2 pixel. This is extremely effective for adding overlays or doing multiple exposures. Images can be monitored to within 0.0005", and can be placed exactly on top of one another. This display allows the operator to abort an overlay image knowing that the registration is incorrect instead of having to wait until after the media has been developed to determine that a registration error has occurred.

## 2.3 LASER AND OPTICAL SUBSYSTEM

The design goal of the LPM is to expose an image which is accurate to within 0.002" of the true digital position of each pixel. This accuracy requires that three basic conditions be met in the optical subsystem. First the laser beam must be directed exactly down the drum centerline. Second, the beam must be deflected 90° by the spinning mirror in a plane perpendicular to the drum centerline. Lastly, the fast and slow scan system must operate so that each pixel is spaced at 0.001" increments in both the X & Y directions. These three conditions and the related LPM components, and how they relate to current LPM accuracy are discussed in the following paragraphs. Also discussed are changes or modifications made during this study which affected the accuracy of these components.

### 2.3.1 Laser Beam Alignment

Aligning the laser to travel along the drum centerline requires adjustments in the laser, modulator, and two turning mirrors. The process is an iterative one in which progressively finer adjustments are made until proper alignment is achieved.

The original laser supplied with the LPM had no provision for locking the aligned unit into position to prevent accidental movement. After the original laser was replaced with the Lexel Model 95, a mounting fixture was fabricated which allows for adjusting and then securing the laser.

With the laser locked in place, the modulator was adjusted to provide the best laser output to the turning mirrors. An excellent adjusting and securing mechanism is provided with the modulator which facilitated this adjustment.

From the modulator the beam is directed down the drum using two turning mirrors. The first mirror has a two position neutral density filter which is used to reduce beam strength depending upon the media to be imaged (ie., plates or film.) Because the new laser operates at a longer wavelength than the original laser more energy at the recording media is required for proper

exposure. For this reason the two mirrors were replacement with the full surface reflecting ones. Also, because mirror movement to change filters produces an alignment error, the two mirrors were secured to the optics table. If at a later date it becomes necessary to filter the beam, the system will need to be restored to its original configuration.

The adjusting mounts on both mirrors were very coarse which made aligning them very difficult. Some additional adjustment sensitivity was gained by installing adjustment screws. It is felt that micrometer adjustments similar to those on the modulator should be installed to facilitate finer beam alignment.

### 2.3.2 SPINNING MIRROR ALIGNMENT

To ensure that the beam is reflected in a plane perpendicular to the drum axis two conditions on the spinning mirror must be met. First, the center of the spinning mirror must be located exactly at the center of the drum. Second, the axis of the spinning mirror must coincide with that of the drum axis.

Preliminary testing indicated that the center of the mirror was displaced from that of the drum by 0.011". In initiating the procedure specified by EOCOM to correct this misalignment a deficiency in the design was revealed. The motor position is adjusted using seven micrometer adjusting screws which allows for correcting both displacement and angular misalignments. Unfortunately when the pitch adjustment servo system was installed four of the seven screws were covered, preventing access to them for adjustment. Of the three accessible screws, two were not marked and one was broken. Fortunately most of the misalignment was compensated for by the available adjustments. (The results of these adjustments will be discussed in Section 3.2.) Any future design should ensure that all adjustments are readily accessible.

### 2.4 SCANNING SUBSYSTEM

Another critical element in the accuracy of the LPM is its ability to scan with equal pixel spacing in both the X and Y directions in increments

of 0.001". The characteristics of the subsystems which control the fast scan (X) and slow scan (Y) are unique and will be discussed separately.

#### 2.4.1 FAST SCAN

The spinning mirror rotates at 2777 rpm, and 10,000 equally spaced pulses are generated for each revolution by a shaft encoder. These pulses are used to drive the data clock which calls for pixel data at a rate of nearly 2.8 million pixels per second. At this rate if a mechanical problem was encountered it is believed that it would result in major inaccuracies in the output. All of the testing performed indicates that this subsystem is operating as designed.

#### 2.4.2 SLOW SCAN

The slow scan subsystem has 2 main functions. The first is to move the spinning mirror down the center axis of the drum while maintaining exact placement of the spinning mirror in the center of the drum. This function was checked with a dial indicator at 4 inch intervals along the drum and was found to be within 0.002".

The second function of the slow scan subsystem is to equally space each scan line at 0.001". Unlike the 2.8 million pixels per second of the fast scan subsystem, the slow scan covers only 46 pixels per second. At this slow speed, the motion of the carriage is very susceptible to mechanical influences, such as friction of the dovetail, or friction of the leadscrew which may cause uneven motion. During the imaging process lightly touching the lead screw revealed that the carriage does not ride smoothly. Even though this is only a qualitative evaluation, the jerky motion of the lead screw/carriage could contribute to the measured slow scan related errors.

Another possible source of error lies with the 48 inch quartz glass scale with optical pickoff. The pickoff generates a pulse for each 2  $\mu$ m of carriage movement or 12 1/2 pulses per pixel. It is possible that dust could influence this delicate system and introduce a new source of error.

The testing performed indicates that there is a problem with the slow scan subsystem, but the exact cause has not yet been determined. (Data indicating this problem is discussed in Section 3.2.) A possible cause of this error could be an unregulated power supply caused by a loose electrical connection. On at least two occasions erratic movement of the scanning mirror was observed and was believed to be due to power surges. This potential problem could be eliminated by further investigation to identify the cause.

### 3.0 ACCURACY TESTING

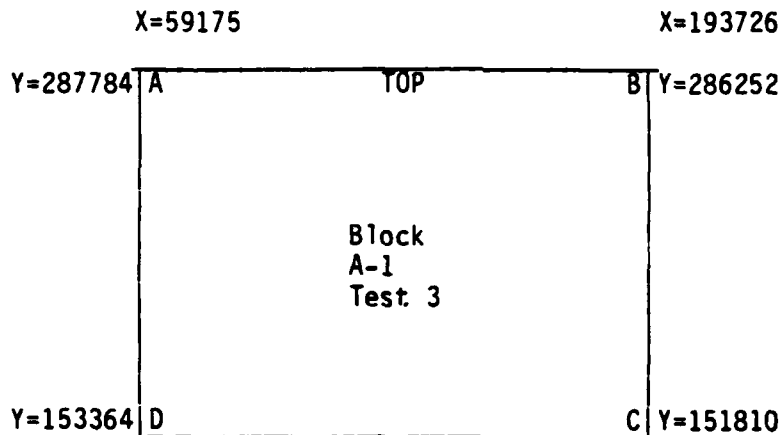
#### 3.1 TESTING PROCEDURE

To determine the overall accuracy of the LPM an accuracy testing procedure was developed to record the repeatable and non-repeatable distortion errors within an exposed image. The most accurate available means for measurement of exposed film was the monocomparater, which can measure short distances to within 1 micron (25.4 microns = 0.001"). A test image was prepared on magnetic tape to print a full format 5.29" checkerboard image. Figure (2) shows the layout of this image. Since the monocomparator can only measure short distance (up to 8"), individual blocks were cut from the full size image for measurement. To aid in analysis, each block of the checkerboard was assigned a column letter and row number [see Figure (2).] The blocks which were measured are outlined with dotted lines.

The four corners of each block were labled A,B,C, and D as shown below. The lengths of each side and diagonals were determined as shown by the following example.

- a) The X and Y coordinates for each corner was recorded with the monocomparator.





b) The distance between any two points was calculated using the following

$$\begin{aligned} \overline{AB} &= \sqrt{(A_x - B_x)^2 + (A_y - B_y)^2} \\ &= \sqrt{(59175 - 193726)^2 + (287784 - 286252)^2} = 134560 \text{ } \mu\text{m} \end{aligned}$$

To reduce the errors involved with operator judgement while measuring with the monocomparater, each block was measured four times, rotating the block 90° between each measurement.

There were a total of 4 exposed images which were measured and analysed (Tests 3,4,5, and 6). Appendix A contains all of the numerical data for each test, including raw data, calculated distances, average distances, and deviations from the average. Deviations data were plotted to determine trends and show the affect of alignments and modifications on accuracies in both the fast scan and slow scan directions.

### 3.2 DISCUSSION OF TESTING RESULTS

In all tests the average of the lengths of the sides of the test blocks were within measurement tolerances of the 5.29" actual length. Therefore if the image was exactly accurate the deviation would be zero. In Figures 4-7, the width of columns represent block lengths AB and DC, and the width of rows are length AD and BC.

Tests 3 & 4 were the first images to be exposed and measured on the monocomparator. Inter-image accuracy (the ability to overlay an image on itself for multiple exposures) was less than 50 microns (0.002"). This is shown by the data for tests 3 & 4 (see Figures 4 and 5) repeating very closely, except for the first point in each column. There was some difficulty encountered in measuring the sides of the boxes located on the edge of the image. For interior boxes the corner of the adjoining box was used to help define where the length of the side stopped. This reference point was not available on the image edge. Consequently small judgement errors resulted in some large deviations. In many cases the edge lengths were not consistent with interior lengths. The anomalous data point in Figure 5, Row 1 is believed to be due to measurement error. A low inter-image error implies that errors are repeatable, which in turn implies that they may be corrected.

Intra-image accuracy (the ability of the LPM to create an image in which each point has the correct location relative to other points on the image) for tests 3 & 4 was poor. The error trend in Figure 4 indicated that either the spinning mirror or the laser was not centered on the drum axis, or both. The columns were relatively narrow in the center of the image and grew progressively wider towards the edges of the image. This trend supported the errors shown in Figure 5.

After test 4 the original laser experienced a fatal breakdown and was replaced. Modifications and alignments to the laser system were accomplished as previously discussed, and test 5 was performed. It should be noted that due to lack of time each box was only measured twice. This may have introduced greater human error into the data as is shown by more erratic trends. The effect of shifting the laser is shown in Figure 4. Trends remained consistent but a shift in location was seen.

At this point the spinning mirror was aligned. As previously discussed some difficulty with this procedure was experienced but was felt that the resulting alignment was relatively accurate. Test 6 was performed. Again, due to lack of time each box was measured only twice.

The results in Figure 6 shows a significant improvement over those in Figure 4. Because the trends in Figure 6 are relatively consistent the large deviations shown by four of the data points are believed to be due to measurement error. Data for column E was found to be improperly measured and is not shown.

Test results shown in Figure 7 show a decrease in accuracy when compared to those in Figure 5. This error implies a problem with the slow scan subsystem. During the period of time when test 6 was performed intermittent errors were experienced with the slow scan system (believed to be caused by a loose power connection.) These intermittent errors could cause unequal fast scan line spacing and the large deviations shown in Figure 7. Unfortunately time did not permit further testing to investigate whether the errors shown in Figure 7 were correctable alignment problems or due to other causes.

Test results are encouraging in that some errors were significantly reduced by realigning LPM components. It is also encouraging that errors are not cumulative between rows and columns (ie. the error between rows or columns should not be significantly greater than that shown in the figures.) It is felt that these results should be considered preliminary and that additional work is needed to further reduce the errors, and more testing is needed to verify accuracy.

#### 4.0 LPM SOFTWARE DOCUMENTATION

During this study a software documentation and user's guide <sup>1</sup> was developed for the LPM. The manual describes the function and operation of each program in the software package and provides a step-by-step discussion of how to image a plate or piece of film.

#### 5.0 EVALUATIONS AND RECOMMENDATIONS

Based upon the results of the tests and other related work with the LPM the following evaluations are made.

- a) The LPM is capable of an inter-image accuracy of less than 0.002".
- b) Because of the consistent inter-image accuracy the pixel data is being handled correctly by the LPM and errors are due to mechanical misalignment or other mechanical/electrical problems.
- c) It is believed that most of the remaining accuracy errors for the LPM are due to improper alignments or problems that are correctable by minor modifications. Further, with some additional work the LPM should be able to accurately output digital information with accuracies that approach the original design specifications.

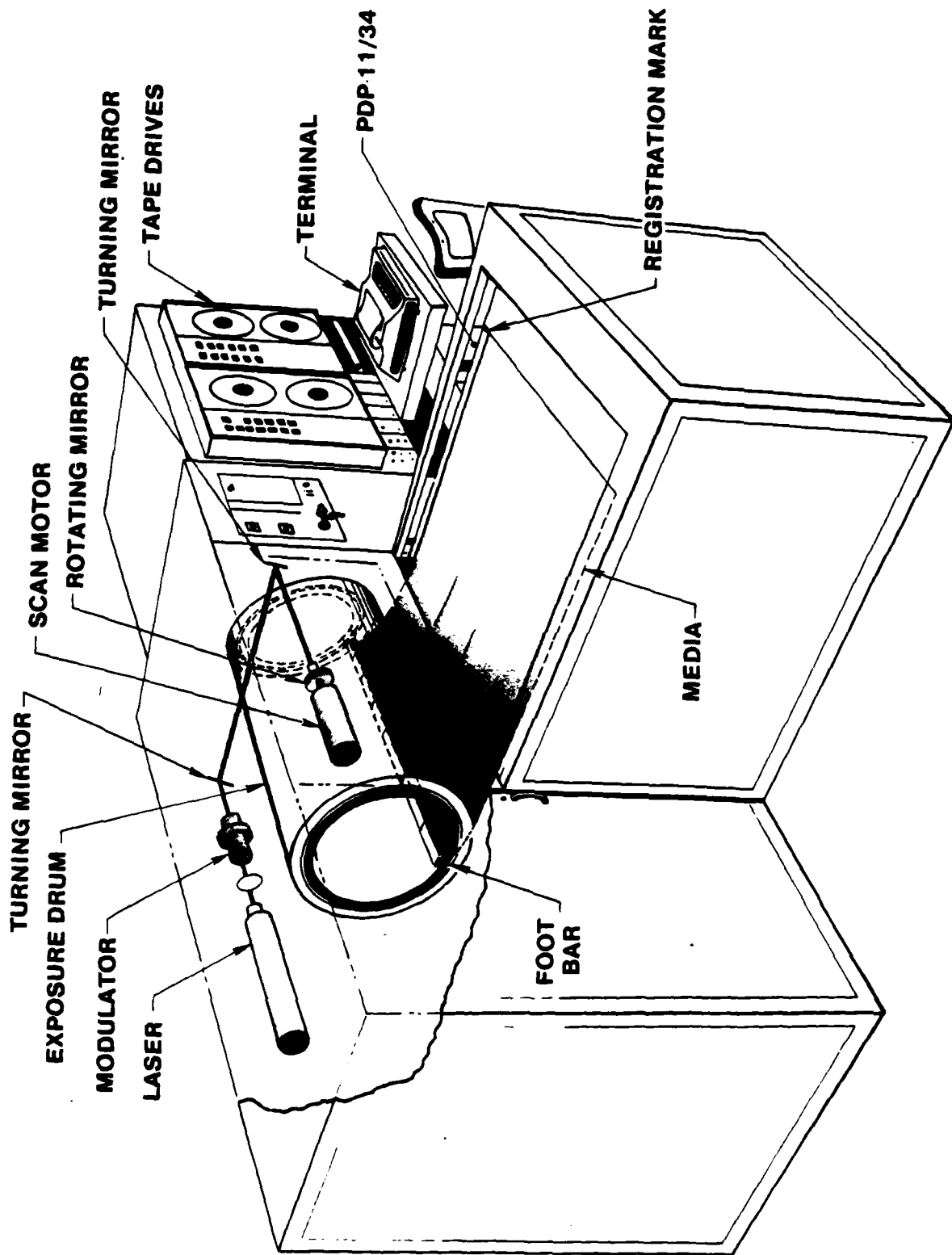
To further improve and evaluate the LPM the following recommendations are made:

- a) Testing should continue to verify LPM accuracy and diagnose problems.
- b) Turning mirror mounts should be replaced with ones having sensitivity in seconds instead of degrees.
- c) The adjusting screws on the spinning mirror should be made more sensitive and accessible.
- d) The computer, tape drives, and formatter should be maintained on a regular basis to provide increased LPM availability.
- e) A vacuum type footbar design should be included in any follow-on LPM designs.
- f) The software package should be upgraded to provide detailed error information and allow greater operator control of imaging process.
- g) A regulated power supply should be provided for the LPM.
- h) Environmental conditions should be controlled in accordance with original equipment specifications.

- i) The LPM should be operated and maintained on a regular basis to avoid problems which arise from lack of use.

## 6.0 REFERENCES

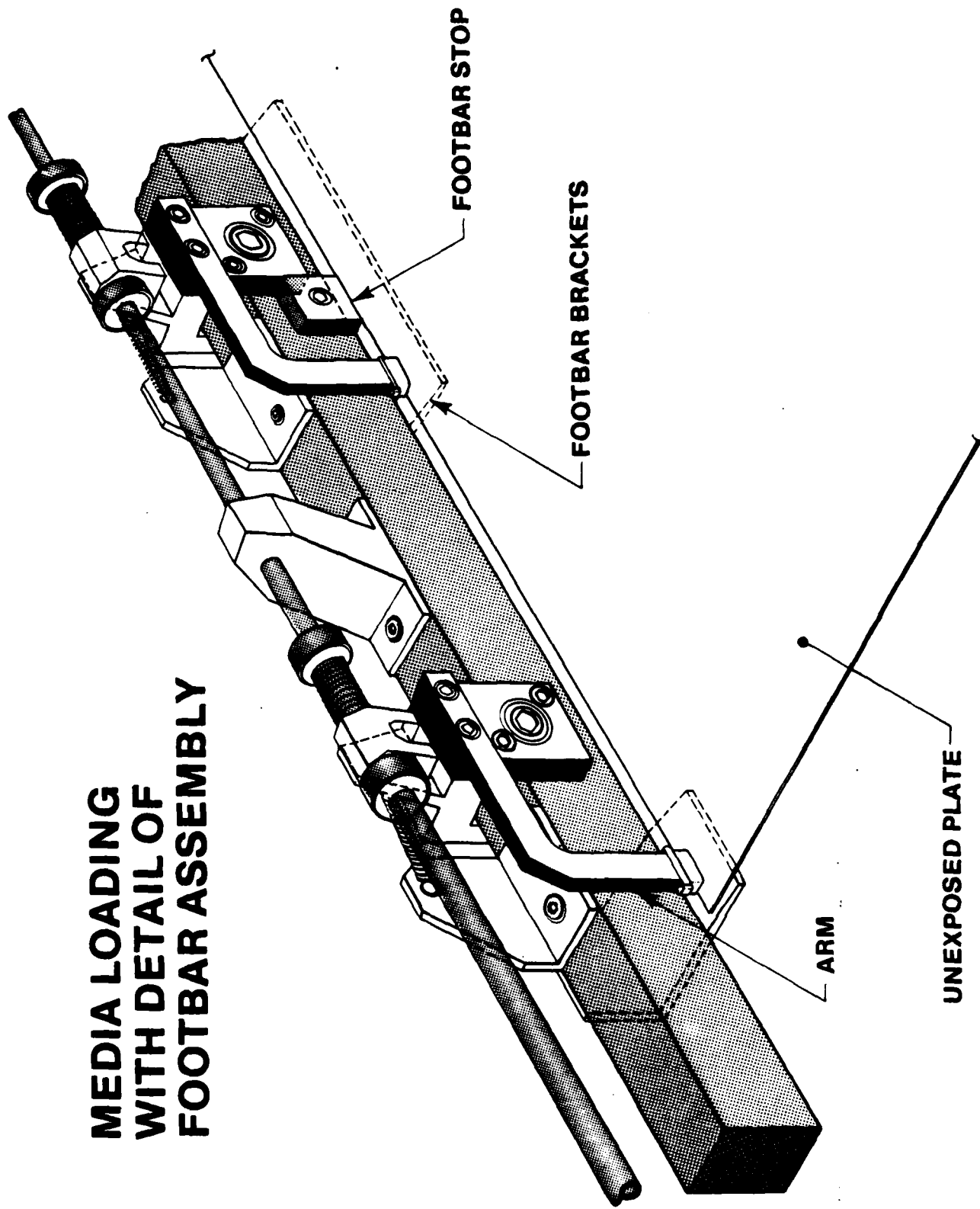
- 1) "Software Documentation and Users' Guide for the Large Format Laser Platemaker", Technology Applications, Inc. (July 1984).



**LARGE FORMAT DIGITAL LASER PLATEMAKER**

FIGURE 1

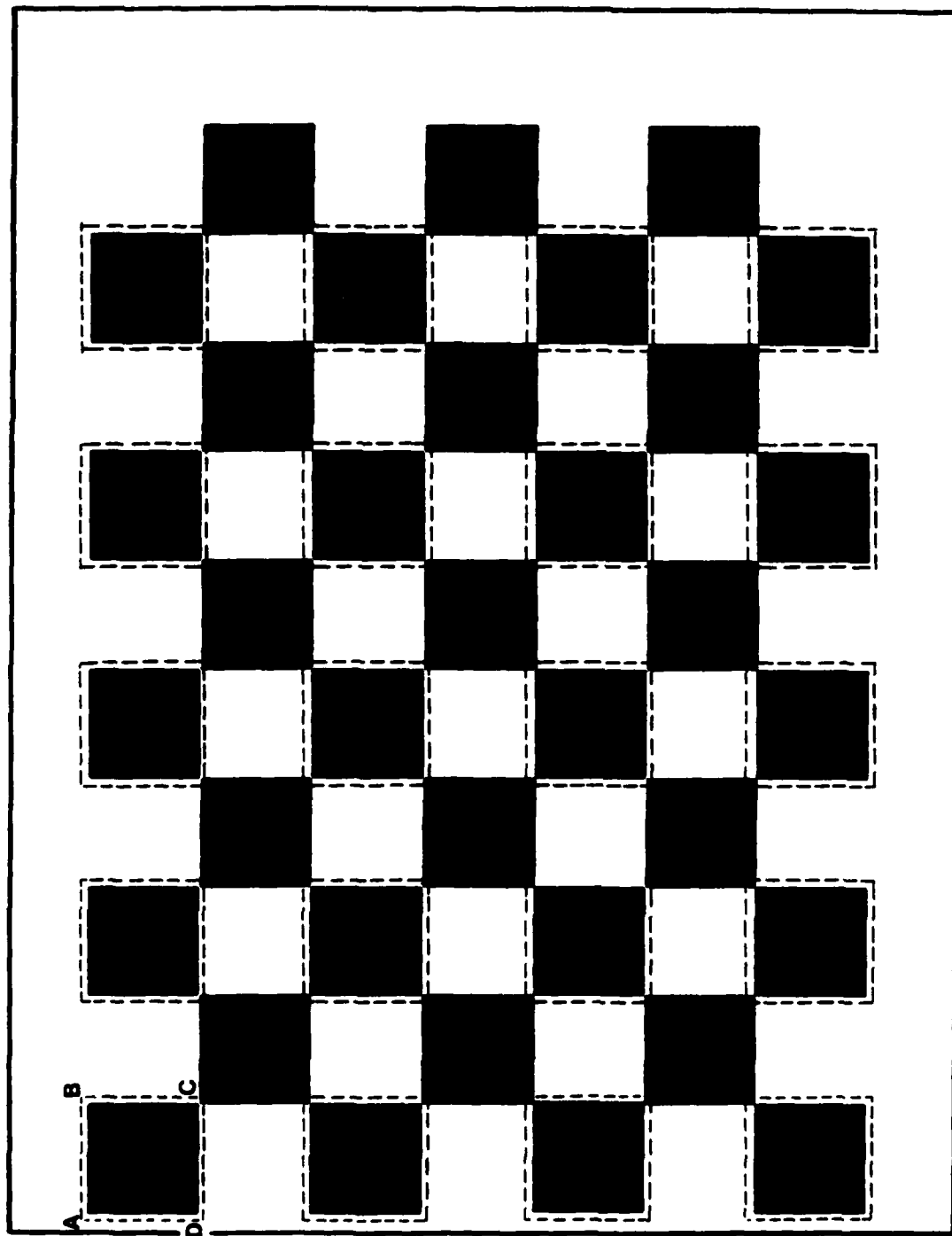
**MEDIA LOADING  
WITH DETAIL OF  
FOOTBAR ASSEMBLY**



**FIGURE 2**

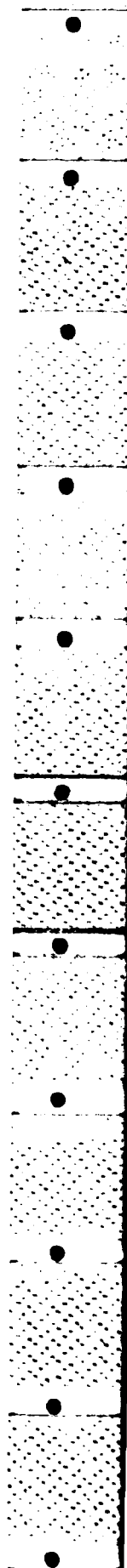
A B C D E F G H I J

1 2 3 4 5 6 7



TEST IMAGE 5.29" CHECKERBOARD

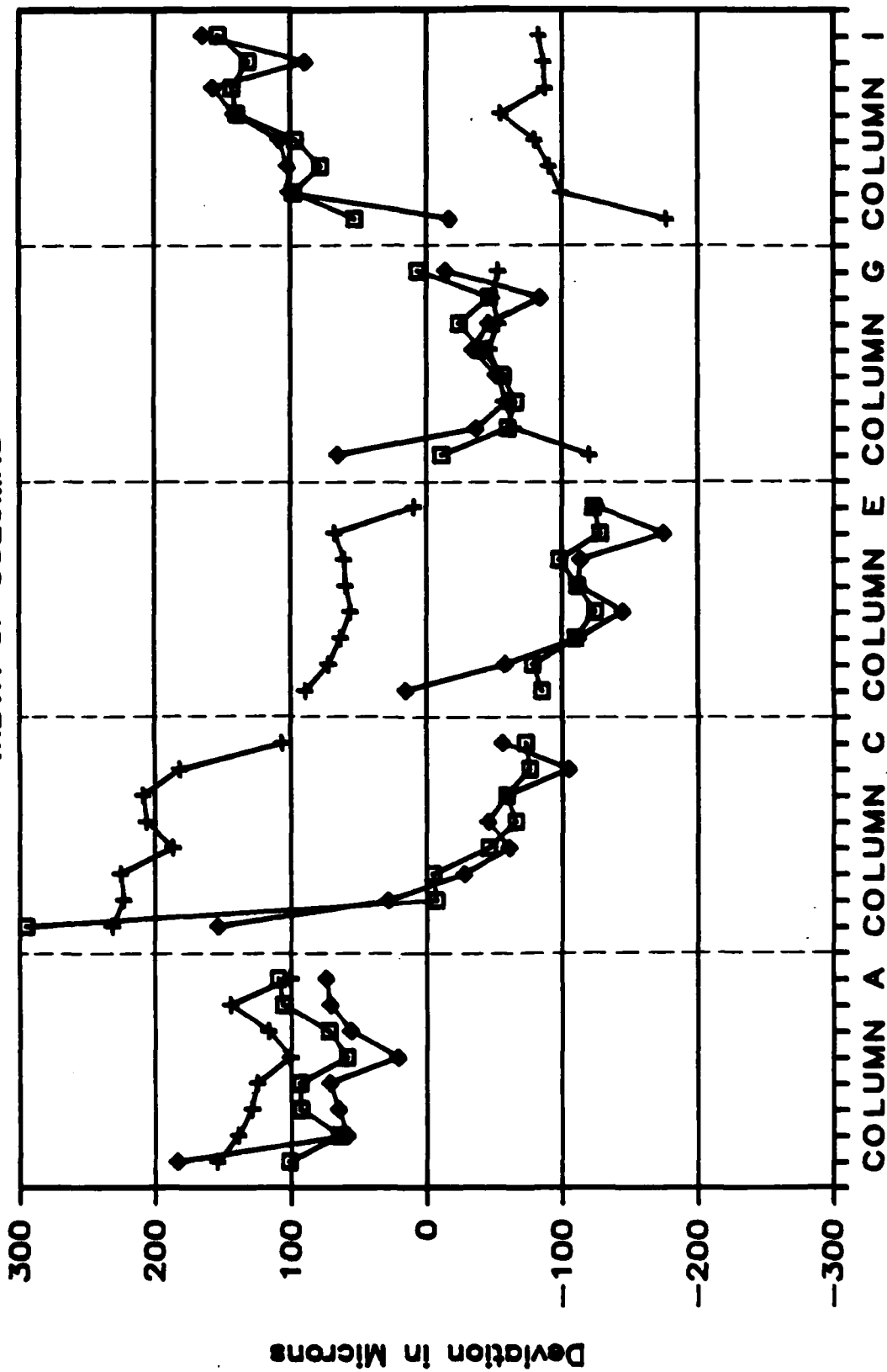
FIGURE 3





# LPM ACCURACY TESTING ---tests 3,4 & 5

WIDTH OF COLUMNS

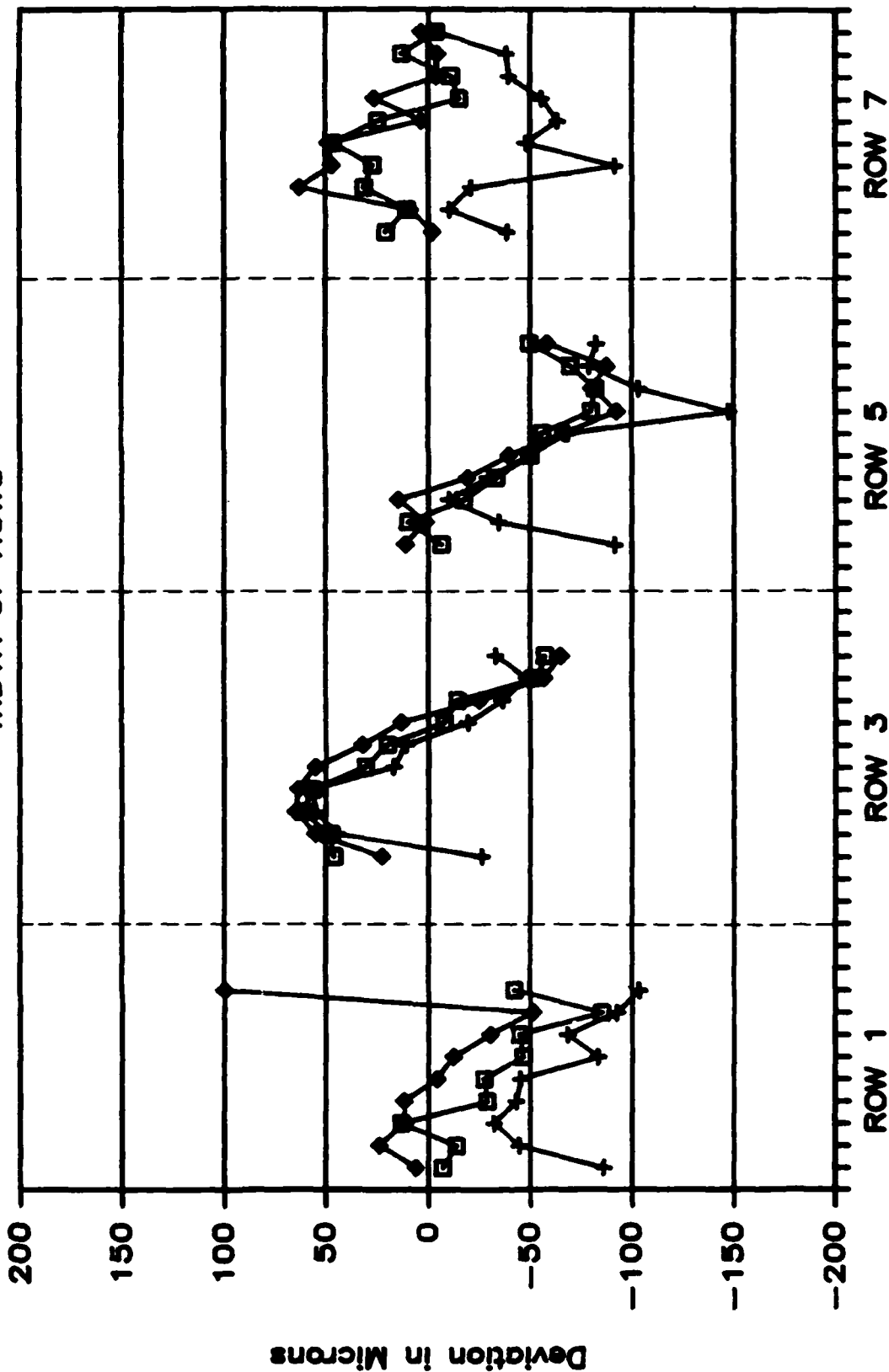


◆ TEST 3  
 □ TEST 4  
 + TEST 5

FIGURE 4

# LPM ACCURACY TESTING --tests 3,4 & 5

WIDTH OF ROWS



◆ TEST 3  
 □ TEST 4  
 + TEST 5

FIGURE 5

# LPM ACCURACY TESTING ---test 6

## WIDTH OF COLUMNS

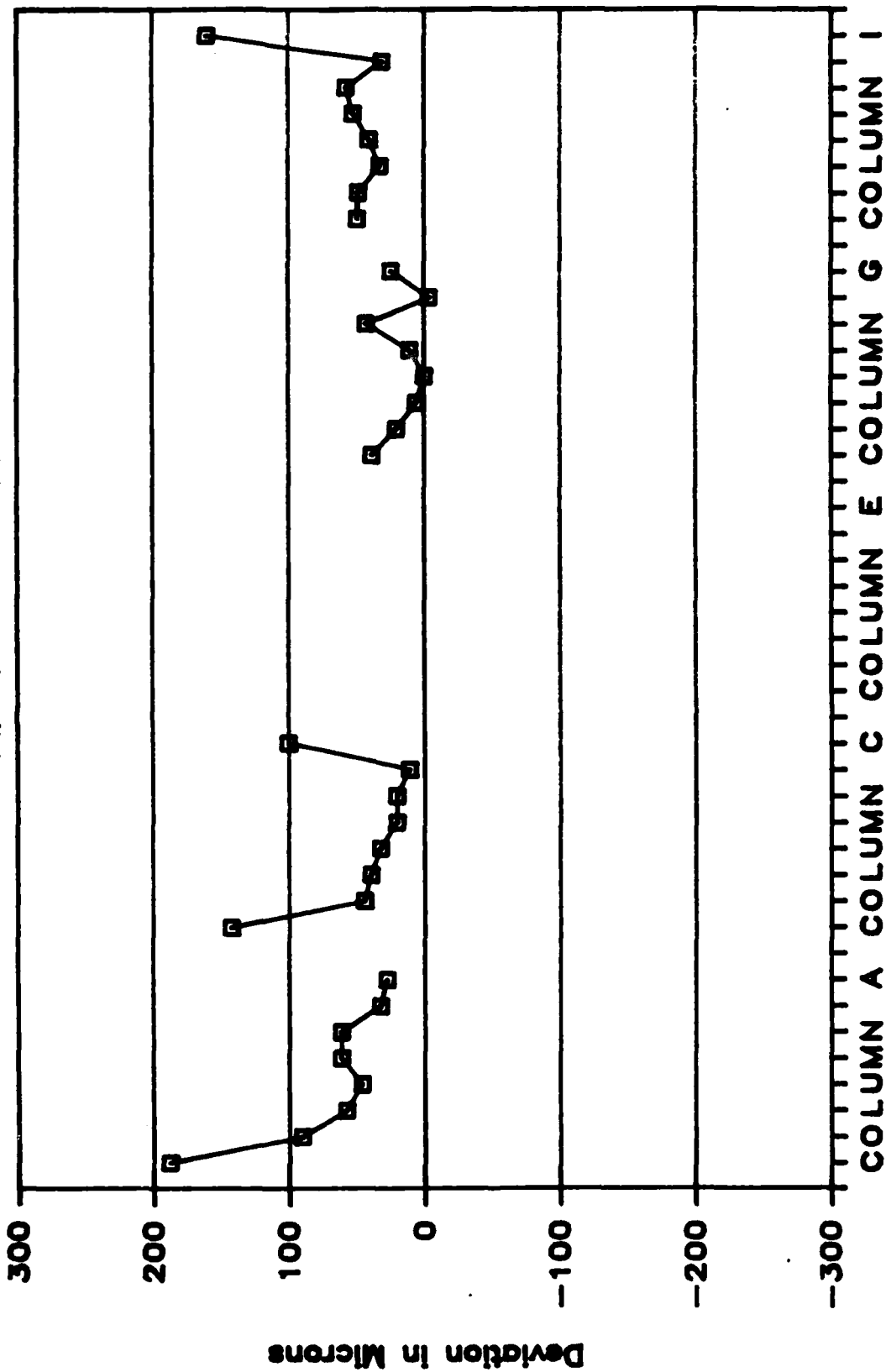


FIGURE 6

# LPM ACCURACY TESTING ---test 6

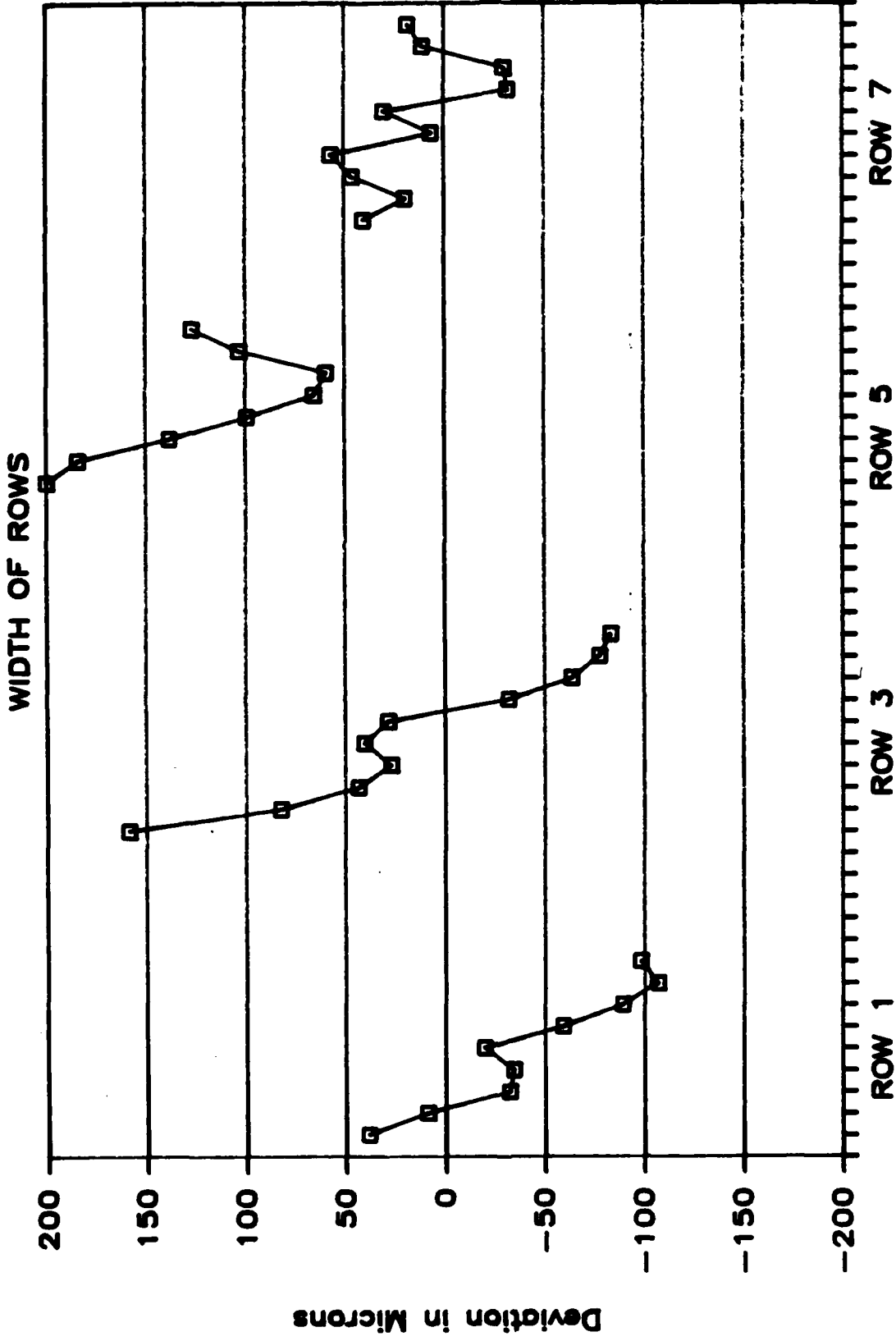


FIGURE 7

APPENDIX A

Digital Laser Platemaker  
Accuracy Testing Data

## DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 3

	A-X	A-Y	B-X	B-Y	C-X	C-Y	D-X	D-Y
A1	59175	287784	193726	286252	192460	151810	57989	153364
A1	197674	313500	196907	178910	62462	179480	63263	313948
A1	229304	188767	94713	188918	94605	323344	229046	323191
A1	107581	178893	107277	313513	241680	314020	241970	179550
C1	88507	304627	223057	302696	221470	168274	87036	170232
C1	213702	310174	212302	175643	77883	176691	79275	311139
C1	226330	182676	31759	182503	91287	316898	225697	317083
C1	91478	176192	92472	310760	226895	310091	225908	175668
E1	82045	308547	216500	308061	216341	173667	81994	174167
E1	208353	308725	207653	174503	73267	174658	73948	309021
E1	216060	178197	81652	179437	82527	313836	216876	312610
E1	89353	175016	90756	309405	225148	308339	223758	174018
G1	78843	306656	213291	305099	211979	170755	77643	172312
G1	214057	309075	212769	174616	78393	175687	79680	310069
G1	219157	174914	84691	177649	37164	311973	221525	309280
G1	90150	178169	89694	312642	224037	313291	224536	178933
I1	84624	308316	218991	310709	218297	172759	83801	173813
I1	215104	313523	216666	179136	78681	180716	80582	315212
I1	217012	178904	92637	176348	33207	314316	217697	313386
I1	87920	179423	94920	313785	222906	312722	221519	178200
A3	86591	319857	223163	318565	221948	184092	87471	195447
A3	218357	318170	217569	183712	83126	184389	83913	318876
A3	22706	185381	37234	185408	39169	319846	223639	317799
A3	90982	168595	92259	303051	226727	301825	225403	167377
C3	102229	304869	236615	304104	235978	169615	101647	170410
C3	236490	291341	236137	156965	101654	157156	102008	291547
C3	237186	150505	192784	151151	103304	285609	237662	284961
C3	190387	166444	161123	300791	235577	300212	234874	165884
E3	92478	304397	226783	303598	226043	169178	31789	169951
E3	223157	294397	222720	160111	38269	160523	68682	294777
E3	221893	149621	37605	150703	68638	285127	222916	284068
E3	84775	168892	85977	303180	220426	301989	219244	167738
G3	87168	318099	221435	315231	220630	180881	86271	181698
G3	219226	296190	217851	161854	33484	163292	84803	297647
G3	216143	151153	91775	151496	32172	285874	216535	285592
G3	90284	169859	80856	304207	215225	303531	214688	169193
I3	80063	321294	214544	318685	211765	184355	77271	186379
I3	209884	286855	208701	152339	74384	153694	75521	288209
I3	205799	139594	71288	141224	73100	275541	207610	273927
I3	69961	173008	71111	307494	205459	306146	204294	171647

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 3

A5	71587	336897	206004	335003	204375	206616	69919	202511
A5	208383	313764	206369	179331	72549	180541	73964	315009
A5	206124	158668	71699	158248	71064	292654	205505	293092
A5	72563	173534	72832	307949	207235	307896	206988	173431
C5	73031	332480	207369	329741	204874	195337	70537	198083
C5	203081	301347	203944	166997	69558	165907	68663	300254
C5	201034	149081	66658	148790	66131	283155	200458	283504
C5	65750	171895	65099	306247	199463	307114	200166	172767
E5	64402	331140	198672	329599	197347	195268	63053	196783
E5	198027	304098	197148	169805	62793	170504	63673	304812
E5	194246	148991	59928	149563	60304	283894	194580	283380
E5	58309	172475	58035	306762	192368	307172	192669	172889
G5	57070	326938	191409	326423	190961	192072	56568	192655
G5	191174	307442	191267	173065	56957	172950	56862	307289
G5	191174	307442	191267	173065	56957	172950	56862	307289
G5	51672	161304	52010	295701	186344	295416	186021	161044
I5	52799	316106	187329	315111	186296	180748	51742	181768
I5	186625	301560	186501	166986	52136	167163	52320	301735
I5	182820	150502	48248	151162	48940	285499	183502	284818
I5	45981	170977	45047	305488	179367	306386	180290	171825
A7	49375	326767	183831	325466	182609	191017	48110	192368
A7	195815	309408	185672	174902	51277	174803	51212	309284
A7	186331	166587	52468	166219	52015	300617	186473	300992
A7	54139	177415	53770	311893	188185	312273	188544	177795
C7	54651	328348	186960	328254	188879	193771	54536	193883
C7	191436	320325	189826	186037	55371	197573	56952	321939
C7	189117	168744	54813	168455	54450	302907	188796	303204
C7	55877	190858	54930	315153	189343	316120	190335	191793
E7	57939	331481	192160	330357	191000	195904	56706	197037
E7	192754	314720	192706	180518	58313	180597	58281	314870
E7	194471	154785	60209	154687	60147	289079	194422	289233
E7	63641	168476	61340	302694	195720	304956	198075	170698
G7	61144	327638	195464	327949	195634	193540	61252	193246
G7	198159	307578	196786	173262	62401	174741	63717	309151
G7	197885	157325	63564	157163	63508	291570	197919	291754
G7	51499	171954	51652	306281	196053	305965	195959	171602
I7	61120	326538	195605	326354	195237	191935	60660	192144
I7	193096	293687	191902	159201	57525	160564	58681	295141
I7	191311	140328	56805	141126	57826	275539	192400	274715
I7	56658	155696	55828	290198	191249	289759	191058	155206

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 3

	AB	BC	CD	DA	AC	BD
A1	134560	134448	134480	134425	190404	189957
A1	134592	134446	134470	134412	190378	189989
A1	134591	134426	134441	134424	190407	189933
A1	134620	134404	134470	134391	190373	189969
C1	134564	134431	134448	134403	190450	189864
C1	134538	134423	134455	134430	190432	189882
C1	134571	134096	134410	134408	190400	189871
C1	134572	134425	134427	134431	190438	189882
E1	134456	134394	134348	134380	190337	189788
E1	134424	134386	134365	134405	190321	189805
E1	134414	134402	134355	134415	190339	189791
E1	134396	134396	134328	134409	190303	189787
G1	134457	134350	134345	134349	190248	189823
G1	134465	134380	134388	134381	190255	189895
G1	134494	134347	134388	134387	190282	189869
G1	134474	134345	134359	134388	190220	189896
I1	134388	137952	134500	134506	190379	192398
I1	134396	137994	134509	134533	190392	192446
I1	134399	137969	134493	134484	190369	192407
I1	134378	137990	134529	134505	190351	192464

## AVERAGE LENGTHS

=====

	AB	BC	CD	DA	AC	BD
A1	134591	134431	134465	134413	190390	189962
C1	134561	134419	134435	134418	190430	189875
E1	134422	134395	134349	134402	190325	189793
G1	134472	134356	134370	134376	190251	189871
I1	134391	137976	134508	134507	190373	192429
A3	134472	134462	134478	134430	190223	190088
C3	134379	134470	134346	134472	190203	189986
E3	134295	134439	134262	134462	190050	189991
G3	134348	134382	134356	134420	189972	190101
I3	134510	134342	134516	134350	189978	190246
A5	134428	134408	134463	134418	190255	189968
C5	134362	134388	134348	134421	190198	189885
E5	134295	134340	134293	134367	190083	189843
G5	134373	134327	134361	134314	190028	189953
I5	134549	134348	134564	134319	190111	190158
A7	134478	134416	134481	134405	190175	190093
C7	134502	134454	134351	134470	190072	190053
E7	134232	134410	134281	134456	189933	190051
G7	134323	134403	134393	134433	189927	190180
I7	134497	134411	134572	134402	189996	190343

## DEVIATION FROM THE AVERAGE

=====

	AB	BC	CD	DA	AC	BD
A3	134478	134478	134484	134416	190236	190086
A3	134460	134445	134489	134446	190223	190087
A3	134487	134452	134486	134432	190233	190089
A3	134462	134474	134455	134426	190202	190091
C3	134388	134491	134333	134460	190217	189975
C3	134376	134483	134361	134482	190206	190008
C3	134404	134459	134360	134457	190204	189993
C3	134349	134449	134330	134488	190185	189967
E3	134307	134422	134256	134448	190063	189960
E3	134287	134452	134255	134476	190045	190003
E3	134292	134428	134282	134451	190049	189988
E3	134293	134454	134256	134474	190042	190012
G3	134329	134403	134361	134404	189990	190079
G3	134343	134375	134361	134431	189968	190109
G3	134368	134379	134352	134440	133994	190110
G3	134349	134371	134339	134406	189940	190105
I3	134506	134359	134520	134344	189994	190238
I3	134521	134324	134520	134370	189979	190257
I3	134521	134329	134520	134345	189975	190247
I3	134491	134355	134504	134340	189962	190242

	AB	BC	CD	DA	AC	BD
A1	184	24	59	6	310	-118
C1	154	12	28	11	350	-205
E1	16	-12	-58	-5	245	-287
G1	56	-51	-37	-31	171	-209
I1	-16	3569	101	100	293	2249
A3	65	55	71	20	143	8
C3	-28	54	-61	55	123	-94
E3	-112	32	-145	55	-30	-89
G3	-59	-25	-51	13	-107	21
I3	103	-65	109	-57	-102	166
A5	21	1	56	11	175	-112
C5	-45	-19	-59	15	118	-195
E5	-112	-67	-113	-39	3	-237
G5	-34	-80	-46	-93	-52	-127
I5	142	-58	158	-88	31	78
A7	71	9	74	-2	35	13
C7	-105	47	-56	63	-8	-27
E7	-175	3	-126	49	-147	-29
G7	-84	-4	-14	26	-153	100
I7	90	4	165	-4	-94	263



DIGITAL LASER FLATENAKER ACCURACY TESTING - TEST 3

A5	134430	134397	134469	134396	190277	189930
A5	134440	134425	134475	134425	190261	189997
A5	134426	134408	134442	134425	190246	189966
A5	134415	134403	134465	134425	190236	189981

GRAPHIC DATA

=====

C5	134366	134427	134365	134420	190239	189886
C5	134353	134390	134350	134422	190190	189890
C5	134376	134366	134327	134424	190196	189869
C5	134354	134367	134349	134419	190167	189895

C	184	6
O	59	24
L	65	11
U	71	12
M	21	-5
N	56	-12
	71	-31
A	74	-51
		100

E5	134279	134338	134303	134364	190094	189823
E5	134296	134357	134311	134356	190094	189849
E5	134313	134332	134277	134389	190103	189837
E5	134287	134334	134283	134361	190040	189864

G5	134340	134352	134394	134284	190041	189937
G5	134377	134310	134339	134312	190006	189949
G5	134377	134310	134339	134312	190006	189949
G5	134397	134334	134371	134348	190059	189978

C	154	
O	28	
L	-28	
U	-61	
M	-45	
N	-59	23
	-105	55
C	-56	65
		64
C	16	55
O	-58	32
L	-112	13
U	-145	-25
M	-112	-57
N	-113	-55
	-175	
E	-126	

I5	134534	134367	134553	134342	190114	190169
I5	134574	134365	134572	134305	190131	190163
I5	134574	134339	134564	134318	190126	190151
I5	134514	134323	134564	134312	190072	190149

A7	134464	134455	134506	134405	190210	190093
A7	134506	134395	134461	134403	190172	190100
A7	134464	134399	134459	134406	190175	190056
A7	134479	134416	134478	134406	190145	190122

O7	134309	134483	134343	134465	190074	190067
O7	134298	134464	134375	134494	190097	190065
O7	134304	134452	134346	134460	190092	190023
O7	134298	134416	134341	134461	190024	190058

C	66	
O	-37	11
L	-59	1
U	-51	15
M	-34	-19
N	-46	-39
	-84	-67
G	-14	-93
		-30
C	-16	-98
O	101	-58
L	103	
U	109	
M	142	
N	158	
	30	-2
I	165	9
		63

E7	134226	134458	134299	134450	189964	190058
E7	134202	134393	134273	134473	189904	190054
E7	134262	134391	134275	134448	189941	190041
E7	134239	134399	134279	134452	189925	190051

G7	134320	134409	134382	134392	189921	190152
G7	134223	134393	134416	134451	189937	190192
G7	134321	134407	134411	134429	189944	190174
G7	134327	134401	134363	134460	189905	190202

I7	134485	134420	134577	134395	190014	190322
I7	134491	134584	134582	134423	190003	190335
I7	134508	134417	134577	134391	190001	190347
I7	134502	134422	134553	134401	189957	190369

C	66	
O	-37	11
L	-59	1
U	-51	15
M	-34	-19
N	-46	-39
	-84	-67
G	-14	-93
		-30
C	-16	-98
O	101	-58
L	103	
U	109	
M	142	
N	158	
	30	-2
I	165	9
		63

DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 3

AVERAGE OF SIDES (corrected) 134407  
(uncorrected) 134454

0 47

W 49

3

AVERAGE OF DIAGONALS (corrected) 190080  
(uncorrected) 190146

7 26

-4

-4

4

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 2

## ANGLES

=====

	A	B	C	D
A1	-0.152	0.098	-0.106	0.150
C1	-0.194	0.140	-0.141	0.194
E1	-0.178	0.146	-0.143	0.175
G1	-0.141	0.097	-0.089	0.132
I1	1.389	-1.323	-0.156	0.091
A3	-0.032	0.035	-0.049	0.046
C3	-0.073	0.059	-0.058	0.072
E3	-0.030	0.016	-0.006	0.020
G3	0.032	-0.029	0.045	-0.049
I3	0.080	-0.078	0.081	-0.084
A5	-0.081	0.096	-0.092	0.077
C5	-0.105	0.098	-0.084	0.090
E5	-0.079	0.078	-0.066	0.067
G5	-0.022	0.017	-0.023	0.028
I5	0.024	-0.017	0.005	-0.011
A7	-0.022	0.023	-0.028	0.027
C7	0.001	0.019	-0.013	-0.008
E7	0.036	-0.015	0.035	-0.056
G7	0.085	-0.055	0.068	-0.096
I7	0.122	-0.090	0.087	-0.119

## DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 4

	A-X	A-Y	B-X	B-Y	C-X	C-Y	D-X	D-Y
A1	68029	299405	202514	299864	203237	165485	68788	165010
A1	208043	304447	207949	169918	73573	169791	73668	304253
A1	216925	173521	82436	173518	82169	307904	216623	307919
A1	57104	166956	67352	301426	201722	301457	201475	166996
C1	80550	302906	215248	303017	215438	168633	91070	168487
C1	216254	284214	216254	149590	81880	149505	81838	283882
C1	215302	154432	80576	154445	80475	288801	214880	288837
C1	81129	166517	81123	301219	215462	301317	215507	166928
E1	74613	325308	208920	325314	209252	190963	74954	190938
E1	63226	175795	63159	310104	197505	310460	197586	176146
E1	212667	164380	78366	164401	78042	298740	212366	298743
E1	224146	313829	224073	179518	89729	179273	89782	313592
G1	87075	314374	221480	314531	221815	180224	87484	180073
G1	229913	299149	220165	164792	95886	164295	95567	298613
G1	225324	159666	30933	159799	90820	294108	225157	294034
G1	81916	172126	81967	306497	216238	306646	216287	172305
I1	80595	311990	215058	312288	215529	177947	91041	177662
I1	215056	302666	218701	168407	84366	167615	82707	302102
I1	215184	160640	80747	160918	80818	295264	215310	295000
I1	72128	175008	72251	309426	206621	309478	206487	174987
A3	69451	313913	203939	313939	204012	179498	69527	179496
A3	76558	170652	76555	305140	210985	305212	211005	170726
A3	217836	175748	83364	175751	83280	310191	217758	310191
A3	211750	319030	211746	184538	77295	184484	77304	318977
C3	39859	309910	225250	310001	225407	175550	91060	175480
C3	78564	192099	78539	326488	212979	326570	213015	192213
C3	196635	179935	62241	179444	61586	313899	196019	314392
C3	208456	297938	209200	163556	74756	162757	74005	297102
E3	72814	286116	207098	286242	207199	151816	72944	151681
E3	215949	294085	215880	159797	81476	159891	81532	294173
E3	210284	174184	76010	174178	76010	308590	210273	308614
E3	71819	174786	71827	309068	206233	309012	206228	174740
G3	90753	303360	215969	303332	214920	168949	80590	168966
G3	206523	282140	205757	147816	71371	148717	72152	283060
G3	181548	182322	47221	181800	46630	316174	181163	316709
G3	76970	157673	76786	292008	211150	292057	211351	157723
I3	207461	300487	207993	166017	73661	165686	73124	300174
I3	220911	154833	36450	154598	86401	288924	220890	289176
I3	73605	164448	73725	298929	208058	298596	207936	164099
I3	69234	290595	203702	290649	203562	156312	69082	156254

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 4

		303812						
A5	211189	303812	211176	169375	76779	169198	76808	303660
A5	213498	154707	79039	154888	79031	289293	213499	289094
A5	196055	160748	196088	295204	61691	295049	61673	160589
A5	78113	310985	212563	311004	212775	176596	78309	176593
C5	75831	311123	210158	311104	210352	176741	76026	176747
C5	209936	312640	209891	178314	75529	178153	75569	312493
C5	211453	178553	77136	178596	76945	312952	211280	312930
C5	77246	177134	77502	311470	211855	311428	211624	177096
E5	207179	314916	207125	180639	72792	180554	72842	314850
E5	73585	308396	207857	308325	207942	173989	73652	174052
E5	80162	174738	80126	309028	214461	309190	214500	174895
E5	213694	181275	79409	181402	79379	315741	213675	315623
G5	76076	303881	210425	303906	210500	169587	76139	169569
G5	84559	177342	84671	311698	218976	311627	218870	177257
G5	84559	177342	84671	311698	218976	311627	218870	177257
G5	202674	312412	202696	178065	68386	178008	68360	312379
I5	74094	316355	208627	315585	207824	181216	73273	182003
I5	209082	300439	209239	165911	74907	165825	74787	300324
I5	206323	151529	71773	151309	71591	285645	206145	285847
I5	69553	165296	69132	299810	203461	300191	203874	165657
A7	72968	307396	207482	307049	207176	172613	72651	172966
A7	209316	300264	209504	165757	75112	165552	74914	300041
A7	211393	162469	76903	162012	76405	296404	210899	296880
A7	79203	168543	79866	303022	213254	303374	213610	168878
C7	86723	314764	221036	314742	221036	180315	86729	180337
C7	73723	187950	73786	322271	208198	322221	208136	187895
C7	200579	174936	66272	174952	66242	309373	200564	309364
C7	213562	301768	213536	167445	79119	167460	79136	301782
E7	76971	304359	213135	304331	213035	169913	78772	169924
E7	203152	309621	203139	175354	68725	175463	68725	309724
E7	208445	185362	74190	185334	74238	319750	208485	319790
E7	84112	180065	84129	314334	218548	314240	218576	179935
G7	87819	324279	222135	324607	222122	190238	87738	190045
G7	227507	303146	227600	168808	93237	168866	93085	303271
G7	218809	164237	84467	164002	84408	298397	218816	298659
G7	75883	180241	75709	314568	210106	314534	210312	180136
I7	77945	309271	212364	309282	212130	174897	77590	174867
I7	208159	310567	208003	176039	73609	176452	73745	310993
I7	209450	180408	74933	180417	75155	314807	209707	314814
I7	79203	179059	79235	313590	213618	313304	213598	178754

U.S. ARMY ENGINEER TOPOGRAPHIC LABS.

	AB	BC	CD	DA	AC	BD	AVERAGE LENGTHS						
							=====						
							AB	BC	CD	DA	AC	BD	
A1	134486	134381	134450	134395	190303	189916							
A1	134529	134376	134462	134375	190301	189940							
A1	134489	134386	134454	134398	190310	189920							
A1	134470	134370	134461	134371	190296	189896	A1	134494	134378	134457	134385	190302	189918
							C1	134688	134363	134385	134405	190313	189997
C1	134698	134384	134368	134420	190326	190005	E1	134307	134345	134314	134365	190192	189758
C1	134624	134374	134377	134416	190271	190005	G1	134381	134307	134332	134347	190145	189831
C1	134726	134356	134405	134406	190351	189997	I1	134445	134349	134490	134350	190190	189974
C1	134702	134339	134389	134379	190306	189982	A3	134485	134441	134486	134438	190205	190112
							C3	134387	134448	134346	134453	190138	190027
E1	134307	134351	134298	134370	190201	189747	E3	134282	134412	134268	134423	189977	190012
E1	134309	134346	134314	134360	190172	189777	G3	134326	134378	134336	134384	189910	190106
E1	134301	134339	134324	134363	190201	189747	I3	134470	134335	134489	134338	189934	190230
E1	134311	134344	134319	134364	190193	189753	A5	134451	134402	134464	134386	190175	190037
							C5	134327	134359	134333	134375	190142	189852
G1	134405	134307	134331	134302	190134	189826	E5	134281	134336	134294	134342	190043	189852
G1	134356	134280	134318	134347	190128	189802	G5	134352	134310	134368	134312	190002	189956
G1	134391	134309	134337	134368	190174	189829	I5	134532	134342	134535	134322	190091	190143
G1	134371	134331	134341	134371	190142	189867	A7	134498	134402	134501	134413	190162	190131
							C7	134316	134419	134319	134424	190041	190014
I1	134463	134342	134489	134329	190137	189960	E7	134264	134417	134269	134439	189929	190062
I1	134461	134337	134489	134351	190173	189954	G7	134346	134381	134399	134377	189953	190218
I1	134437	134346	134492	134360	190205	189961	I7	134524	134388	134546	134405	189978	190348
I1	134418	134370	134491	134359	190186	189982							
A3	134468	134441	134485	134417	190195	190109							
A3	134488	134430	134486	134447	190203	190116							
A3	134472	134440	134478	134443	190211	190094							
A3	134492	134451	134493	134446	190212	190128							
							AB	BC	CD	DA	AC	BD	
C3	134381	134451	134347	134450	190140	190022	A1	102	-14	65	-7	248	-136
C3	134389	134440	134357	134451	190131	190036	C1	296	-29	-7	13	259	-57
C3	134395	134456	134334	134458	190151	190020	E1	-85	-47	-78	-27	138	-296
C3	134384	134446	134347	134454	190130	190032	G1	-11	-95	-60	-45	91	-223
							I1	53	-43	98	-42	136	-80
E3	134294	134426	134255	134435	199999	190010	A3	33	49	34	46	151	58
E3	134288	134404	134282	134417	189975	190017	C3	-5	58	-46	61	84	-27
E3	134274	134412	134263	134430	189985	189999	E3	-110	20	-124	31	-77	-42
E3	134282	134406	134272	134409	189957	190020	G3	-66	-14	-56	-8	-144	52
							I3	78	-57	97	-54	-120	176
G3	134316	134383	134330	134394	199913	190102	A5	59	10	72	-6	121	-17
G3	134326	134389	134345	134374	189915	190108	C5	-65	-33	-59	-17	88	-202
G3	134328	134375	134334	134388	189999	190108	E5	-111	-56	-98	-50	-11	-202
G3	134335	134364	134334	134381	189903	190106	G5	-40	-92	-24	-30	-52	-38
							I5	140	-50	143	-70	37	99
I3	134471	134332	134489	134337	189931	190231	A7	106	10	109	21	108	77
I3	134461	134336	134489	134343	189937	190224	C7	-76	27	-73	32	-13	-40
I3	134481	134333	134497	134331	189930	190241	E7	-128	25	-123	47	-125	8
I3	134468	134337	134480	134341	189937	190222	G7	-46	-11	7	-15	-201	164
							I7	132	-4	154	13	-76	294

## DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 4

A5	134437	134397	134462	134381	190229	189966			
A5	134459	134405	134468	134387	190249	189976			
A5	134456	134397	134460	134382	189975	190233			
A5	134450	134408	134466	134392	190248	189975			
GRAPHIC DATA									
=====									
C5	134327	134363	134326	134376	190143	189850			
C5	134326	134362	134340	134367	190137	189859	C	102	154
C5	134317	134356	134335	134377	190146	189843	O	65	139
C5	134336	134353	134332	134378	190143	189855	L	93	129
							U	94	125
E5	134277	134333	134296	134337	190034	189854	M	59	101
E5	134272	134336	134290	134344	190045	189843	N	72	117
E5	134290	134335	134295	134338	190036	189863		106	145
E5	134285	134339	134296	134348	190057	189849	A	109	101
									74
G5	134349	134319	134361	134312	190012	189945	C	296	232
G5	134356	134305	134370	134311	190001	189957	O	-7	224
G5	134356	134305	134370	134311	190001	189957	L	-5	226
G5	134347	134310	134371	134314	189994	189964	U	-46	187
							M	-65	207
I5	134535	134371	134553	134355	190122	190171	N	-59	209
I5	134528	134332	134499	134295	190063	190116		-76	182
I5	134550	134336	134554	134318	190105	190148	C	-73	107
I5	134515	134330	134535	134321	190074	190138			
							C	-85	89
A7	134514	134435	134525	134430	190206	190152	O	-78	72
A7	134507	134392	134489	134402	190153	190123	L	-110	63
A7	134491	134393	134495	134412	190159	190117	U	-124	56
A7	134473	134388	134496	134407	190129	190133	M	-111	60
							N	-98	61
O7	134313	134427	134307	134427	190043	190008		-128	68
O7	134321	134412	134326	134413	190032	190018	E	-123	9
O7	134307	134421	134322	134428	190052	190002			
O7	134323	134417	134322	134426	190036	190026	C	-11	-120
							O	-60	-65
E7	134264	134418	134263	134435	189936	190049	L	-66	-57
E7	134267	134414	134261	134427	189918	190059	U	-56	-53
E7	134255	134416	134247	134428	189925	190036	M	-40	-46
E7	134269	134419	134305	134464	189937	190103	N	-24	-53
								-46	-48
G7	134376	134369	134384	134234	189748	190225	G	7	-53
G7	134338	134363	134405	134422	189894	190196			
G7	134342	134395	134408	134422	189901	190216	C	53	-177
G7	134327	134397	134398	134429	189869	190237	O	98	-99
							L	79	-90
I7	134519	134385	134540	134404	189971	190346	U	37	-79
I7	134528	134395	134541	134415	189975	190362	M	140	-54
I7	134517	134390	134552	134406	189995	190333	N	143	-87
I7	134531	134383	134550	134395	189971	190353		132	-85
							I	154	-82

R  
O  
W  
1R  
O  
W

S

R  
O  
W

S

R

# DIGITAL LASER PLATENAKER ACCURACY TESTING - TEST 4

## ANGLES

=====

	A	B	C	D
A1	-0.125	0.109	-0.107	0.122
B1	-0.169	0.039	-0.022	0.151
E1	-0.133	0.136	-0.128	0.125
G1	-0.114	0.092	-0.076	0.096
I1	-0.056	0.075	-0.074	0.055
A3	-0.028	0.028	-0.029	0.029
C3	-0.043	0.026	-0.024	0.041
E3	0.005	-0.011	0.016	-0.010
G3	0.060	-0.056	0.058	-0.062
I3	0.092	-0.085	0.086	-0.094
A5	-0.035	0.041	-0.048	0.042
C5	-0.090	0.092	-0.086	0.080
E5	-0.056	0.061	-0.059	0.053
G5	-0.011	0.018	-0.017	0.010
I5	0.021	-0.019	0.011	-0.012
A7	-0.011	0.012	-0.008	0.006
C7	-0.008	0.010	-0.008	0.007
E7	0.026	-0.034	0.043	-0.046
G7	0.122	-0.100	0.098	-0.121
I7	0.110	-0.103	0.110	-0.120



# DIGITAL LASER PLATENAKER ACCURACY TESTING - TEST 4

-7	-86	6
-14	-44	24
13	-32	11
-29	-43	12
-27	-45	-5
-47	-83	-12
-45	-68	-31
-85	-92	-51
-42	-104	100

46	-26	23
49	44	55
61	55	65
56	57	64
31	17	55
20	11	32
-8	-20	13
-14	-37	-15
-54	-48	-57
-57	-33	-65

-6	-92	11
10	-35	1
-17	-10	15
-32	-30	-19
-50	-50	-39
-56	-69	-67
-30	-147	-93
-32	-106	-90
-70	-79	-88
-50	-83	-58

21	-39	-2
10	-10	9
32	-21	63

## DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 5

	A-X	A-Y	B-X	B-Y	C-X	C-Y	D-X	D-Y
A1	87740	294018	222310	293931	222123	159545	87570	159693
A1	228175	283917	227449	149347	93093	150163	93841	284720
A1	87740	294018	222310	293931	222123	159545	87570	159693
A1	228175	283917	227449	149347	93093	150163	93841	284720
C1	72841	291707	207486	289822	205724	155443	71087	157341
C1	209002	287640	209298	153001	74942	152591	74611	287221
C1	72841	291707	207486	289822	205724	155443	71087	157341
C1	209002	287640	209298	153001	74942	152591	74611	287221
E1	82967	309591	217488	309814	213006	175467	83544	175216
E1	226324	300062	226879	165572	92563	164741	91960	299255
E1	82967	309591	217488	309814	213006	175467	83544	175216
E1	226324	300062	226879	165572	92563	164741	91960	299255
G1	72632	306258	206905	305714	206612	171351	72257	171925
G1	212582	314541	213634	180226	79355	178975	78224	313318
G1	72632	306258	206905	305714	206612	171351	72257	171925
G1	212582	314541	213634	180226	79355	178975	78224	313318
I1	79185	289913	212410	292007	214593	157737	80312	155616
I1	211201	306622	213000	172395	78723	170540	76900	304865
I1	79185	289913	212410	292007	214593	157737	80312	155616
I1	211201	306622	213000	172395	78723	170540	76900	304865
A3	76195	289168	210747	289756	211193	155324	76674	154790
A3	212184	284844	211937	150306	77448	150679	77792	285242
A3	76195	289168	210747	289756	211193	155324	76674	154790
A3	212184	284844	211937	150306	77448	150679	77792	285242
C3	79935	312983	214588	313041	214797	173585	80196	178427
C3	218712	291739	217760	157110	83272	157994	84227	292597
C3	79935	312983	214588	313041	214797	173585	80196	178427
C3	218712	291739	217760	157110	83272	157994	84227	292597
E3	34520	312285	218995	311955	218878	177509	84410	177950
E3	222323	290006	222382	155522	87973	155263	87891	289740
E3	34520	312285	218995	311955	218878	177509	84410	177950
E3	222323	290006	222382	155522	87973	155263	87891	289740
G3	55307	301424	199671	301582	200024	167210	65657	167047
G3	197596	305363	197407	171008	63019	171022	63179	305382
G3	55307	301424	199671	301582	200024	167210	65657	167047
G3	197596	305363	197407	171008	63019	171022	63179	305382
I3	99363	300976	223704	300082	222794	165700	88433	166632
I3	207347	319571	205787	185271	71335	186945	72968	321246
I3	99363	300976	223704	300082	222794	165700	88433	166632
I3	207347	319571	205787	185271	71335	186945	72968	321246

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 5

A5	76246	292036	210755	292414	211062	158001	76540	157714
A5	213857	306464	214046	171939	79695	171815	79529	306360
A5	76246	292036	210755	292414	211062	158001	76540	157714
A5	213857	306464	214046	171939	79695	171815	79529	306360
C5	70945	297892	205586	297226	205069	162865	70444	163504
C5	213189	285700	212216	151099	77806	151909	78767	286531
C5	70945	297892	205586	297226	205069	162865	70444	163504
C5	213189	285700	212216	151099	77806	151909	78767	286531
E5	84770	305575	219245	305403	219391	171043	84934	171213
E5	217122	305218	215439	170751	81110	172107	82757	306595
E5	84770	305575	219245	305403	219391	171043	84934	171213
E5	217122	305218	215439	170751	81110	172107	82757	306595
G5	211741	293798	211815	159427	77502	159140	77472	293504
G5	211741	293798	211815	159427	77502	159140	77472	293504
G5	211741	293798	211815	159427	77502	159140	77472	293504
G5	211741	293798	211815	159427	77502	159140	77472	293504
I5	78090	304589	212448	306074	212970	171745	79649	170274
I5	217683	308789	218053	174431	83723	174036	83332	308365
I5	78090	304589	212448	306074	212970	171745	79649	170274
I5	217683	308789	218053	174431	83723	174036	83332	308365
A7	84331	302116	218906	302435	219073	168030	84576	167744
A7	218376	307913	217439	173368	83035	174434	83996	308968
A7	84331	302116	218906	302435	219073	168030	84576	167744
A7	218376	307913	217439	173368	83035	174434	83996	308968
C7	81645	301879	216256	302600	217055	168218	82547	167506
C7	218127	285521	217473	150938	83208	151356	83712	295892
C7	81645	301879	216256	302600	217055	168218	82547	167506
C7	218127	285521	217473	150938	83208	151356	83712	295892
E7	89682	312254	224176	311379	223523	177019	89109	177881
E7	205453	303801	206162	163331	71329	163493	71093	302841
E7	89682	312254	224176	311379	223523	177019	89109	177881
E7	205453	303801	206162	163331	71329	163493	71093	302841
G7	88767	311218	223147	310164	222295	175791	87937	176861
G7	225188	298621	226073	164271	91638	163216	90829	297579
G7	88767	311218	223147	310164	222295	175791	87937	176861
G7	225188	298621	226073	164271	91638	163216	90829	297579
I7	75717	307827	216041	309335	211577	174931	77277	173472
I7	216649	300657	216516	166327	82193	166448	82256	300809
I7	75717	307827	216041	309335	211577	174931	77277	173472
I7	216649	300657	216516	166327	82193	166448	82256	300809

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 5

	AB	BC	CD	DA	AC	BD
A1	134570	134386	134553	134325	190110	190196
A1	134572	134358	134559	134336	190098	190202
A1	134570	134386	134553	134325	190110	190196
A1	134572	134358	134559	134336	190098	190202

C1	134658	134391	134650	134377	190331	190147
C1	134639	134357	134630	134392	190290	190146
C1	134658	134391	134650	134377	190331	190147
C1	134639	134357	134630	134392	190290	190146

E1	134521	134348	134462	134376	190328	189888
E1	134491	134319	134515	134366	190273	189932
E1	134521	134348	134462	134376	190328	189888
E1	134491	134319	134515	134366	190273	189932

G1	134274	134363	134356	134334	190133	189815
G1	134319	134295	134348	134364	190073	189867
G1	134274	134363	134356	134334	190133	189815
G1	134319	134295	134348	134364	190073	189867

I1	134241	134288	134298	134314	189941	189875
I1	134239	134290	134337	134312	189918	189925
I1	134241	134288	134298	134314	189941	189875
I1	134239	134290	134337	134312	189918	189925

A3	134553	134433	134520	134389	190102	190247
A3	134538	134490	134563	134393	190142	190270
A3	134553	134433	134520	134389	190102	190247
A3	134538	134490	134563	134393	190142	190270

C3	134653	134456	134601	134456	190325	190216
C3	134632	134491	134606	134488	190246	190231
C3	134653	134456	134601	134456	190325	190216
C3	134632	134491	134606	134488	190246	190231

E3	134475	134446	134466	134435	190307	189993
E3	134484	134409	134477	134432	190278	190006
E3	134475	134446	134466	134435	190307	189993
E3	134484	134409	134477	134432	190278	190006

G3	134364	134372	134367	134377	190163	189893
G3	134355	134388	134360	134417	190154	189930
G3	134364	134372	134367	134377	190163	189893
G3	134355	134388	134360	134417	190154	189930

I3	134344	134385	134364	134347	190009	190019
I3	134310	134382	134311	134389	189971	190023
I3	134344	134385	134364	134347	190009	190019
I3	134310	134382	134311	134389	189971	190023

## AVERAGE LENGTHS

=====

	AB	BC	CD	DA	AC	BD
A1	134571	134372	134556	134331	190104	190199
C1	134649	134374	134640	134385	190310	190147
E1	134506	134333	134489	134371	190300	189910
G1	134297	134324	134352	134349	190103	189841
I1	134240	134289	134318	134313	189929	189900
A3	134546	134461	134542	134391	190122	190259
C3	134643	134474	134604	134472	190336	190223
E3	134480	134428	134473	134434	190292	189999
G3	134360	134380	134364	134397	190159	189912
I3	134327	134384	134338	134368	189990	190021
A5	134517	134382	134534	134325	190093	190160
C5	134624	134387	134626	134407	190329	190125
E5	134476	134348	134478	134367	190315	189874
G5	134371	134313	134364	134269	190139	189802
I5	134362	134334	134329	134338	190019	189954
A7	134562	134407	134517	134378	190090	190237
C7	134599	134325	134523	134396	190269	190044
E7	134484	134353	134426	134369	190251	189912
G7	134369	134377	134364	134361	190163	189886
I7	134331	134413	134335	134379	190045	189995

## DEVIATION FROM THE AVERAGE

=====

	AB	BC	CD	DA	AC	BD
A1	154	-44	139	-86	10	105
C1	232	-43	224	-32	216	53
E1	89	-53	72	-45	207	-184
G1	-120	-93	-65	-68	3	-253
I1	-177	-128	-99	-104	-165	-194
A3	129	44	125	-26	28	165
C3	226	57	187	55	242	129
E3	63	11	56	17	198	-35
G3	-57	-37	-53	-20	65	-182
I3	-90	-33	-79	-48	-104	-73
A5	101	-35	117	-92	-1	66
C5	207	-30	209	-10	235	31
E5	60	-69	61	-50	221	-220
G5	-46	-103	-53	-147	45	-292
I5	-54	-83	-87	-79	-75	-140
A7	145	-10	101	-39	-4	144
C7	182	-92	107	-21	175	-50
E7	68	-63	9	-48	157	-182
G7	-48	-39	-53	-55	69	-208
I7	-85	-4	-82	-38	-49	-99

DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 5

A5	134510	134413	134522	134322	190107	190152				
A5	134525	134351	134545	134328	190078	190168				
A5	134510	134413	134522	134322	190107	190152				
A5	134525	134351	134545	134328	190078	190168				
							GRAPHIC DATA			
							=====			
C5	134643	134362	134627	134389	190320	190118				
C5	134605	134412	134625	134425	190338	190133	C	154		-86
C5	134643	134362	134627	134389	190320	190118	O	139		-44
C5	134605	134412	134625	134425	190338	190133	L	129	R	-32
							U	125	O	-43
E5	134475	134360	134457	134362	190320	189859	M	101	W	-45
E5	134478	134336	134498	134372	190310	189890	N	117		-83
E5	134475	134360	134457	134362	190320	189859		145	I	-68
E5	134478	134336	134498	134372	190310	189890	A	101		-93
										-104
G5	134371	134313	134364	134269	190139	189802	C	232		
G5	134371	134313	134364	134269	190139	189802	O	224		
G5	134371	134313	134364	134269	190139	189802	L	226		
G5	134371	134313	134364	134269	190139	189802	U	187		
							M	207		
I5	134366	134338	134329	134324	190029	189940	N	209		-26
I5	134359	134331	134330	134352	190010	189969		182		44
I5	134366	134338	134329	134324	190029	189940	C	107	R	55
I5	134359	134331	134330	134352	190010	189969			O	57
							C	89	W	17
A7	134575	134405	134497	134372	190091	190227	O	72		11
A7	134548	134408	134537	134384	190089	190248	L	63	S	-20
A7	134575	134405	134497	134372	190091	190227	U	56		-37
A7	134548	134408	134537	134384	190089	190248	M	60		-48
							N	61		-33
								58		
C7	134613	134384	134510	134376	190266	190075				
C7	134585	134266	134537	134416	190272	190012	E	9		
C7	134613	134384	134510	134376	190266	190075				
C7	134585	134266	134537	134416	190272	190012	C	-120		
							O	-55		-92
E7	134497	134371	134417	134374	190274	189907	L	-57		-35
E7	134472	134336	134435	134363	190228	189917	U	-53	R	-10
E7	134497	134371	134417	134374	190274	189907	M	-46	O	-30
E7	134472	134336	134435	134363	190228	189917	N	-53	W	-50
								-48		-69
G7	134384	134376	134362	134360	190185	189872	G	-53	S	-147
G7	134353	134379	134366	134363	190142	189900				-103
G7	134384	134376	134362	134360	190185	189872	C	-177		-79
G7	134353	134379	134366	134363	190142	189900	O	-39		-83
							L	-30		
I7	134332	134413	134308	134364	190051	189961	U	-79		
I7	134330	134413	134361	134393	190029	190029	M	-54		
I7	134332	134413	134308	134364	190051	189961	N	-87		
I7	134330	134413	134361	134393	190029	190029		-85		-39
							I	-32		-10
									R	-21

DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 5

AVERAGE OF SIDES (corrected) 134417  
(uncorrected) 134417

0 -32

W -48

-63

AVERAGE OF DIAGONALS (corrected) 190094

7 -55

(uncorrected) 190094

-39

-38

-4

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 5

## ANGLES =====

	A	B	C	D
A1	0.034	-0.041	0.023	-0.017
C1	-0.053	0.050	-0.045	0.049
E1	-0.129	0.122	-0.106	0.113
G1	-0.072	0.096	-0.086	0.062
I1	0.002	0.031	-0.020	-0.013
A3	0.055	-0.057	0.027	-0.025
C3	-0.042	0.025	-0.026	0.042
E3	-0.091	0.088	-0.085	0.088
G3	-0.077	0.079	-0.072	0.070
I3	0.015	-0.010	0.004	-0.008
A5	0.036	-0.029	0.005	-0.012
C5	-0.065	0.066	-0.058	0.057
E5	-0.137	0.137	-0.129	0.128
G5	-0.094	0.091	-0.110	0.113
I5	-0.027	0.013	-0.012	0.026
A7	0.041	-0.060	0.048	-0.029
C7	-0.053	0.067	-0.037	0.069
E7	-0.118	0.093	-0.086	0.111
G7	-0.081	0.079	-0.086	0.088
I7	-0.007	0.008	-0.023	0.022

## DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 6

	A-X	A-Y	B-X	B-Y	C-X	C-Y	D-X	D-Y
A1	80312	304532	214907	304319	214620	163880	30116	170097
A1	204042	332963	204590	198369	70198	197884	69587	332373
A1	80312	304532	214907	304319	214620	163880	30116	170097
A1	204042	332963	204590	198369	70198	197884	69587	332373
C1	86817	330231	221380	330139	221242	195762	86793	195836
C1	58371	187938	58209	322475	192577	322515	192725	188061
C1	86817	330231	221380	330139	221242	195762	86793	195836
C1	58371	187938	58209	322475	192577	322515	192725	188061
E1	74414	300815	207959	303371	210391	169034	76967	166428
E1	85905	177058	86813	310643	221145	309576	220265	176130
E1	74414	300815	207959	303371	210391	169034	76967	166428
E1	85905	177058	86813	310643	221145	309576	220265	176130
G1	82346	294075	216771	297601	220139	163323	85745	159771
G1	92768	184927	92957	319347	227237	319018	227056	184604
G1	82346	294075	216771	297601	220139	163323	85745	159771
G1	92768	184927	92957	319347	227237	319018	227056	184604
I1	82256	298298	216637	298187	216462	163905	81976	163999
I1	216387	293379	216209	158908	81936	159269	82069	293693
I1	82256	298298	216637	298187	216462	163905	81976	163999
I1	216387	293379	216209	158908	81936	159269	82069	293693
A3	81561	315258	216048	315390	216356	180949	81929	180748
A3	201283	317259	201169	182816	66724	182697	66741	317147
A3	81561	315258	216048	315390	216356	180949	81929	180748
A3	201283	317259	201169	182816	66724	182697	66741	317147
C3	92157	298104	226596	298517	227110	164088	92675	163639
C3	91093	192626	88818	327060	223236	329399	225507	194975
C3	92157	298104	226596	298517	227110	164088	92675	163639
C3	91093	192626	88818	327060	223236	329399	225507	194975
E3	92580	323198	225959	322530	225322	188096	91944	188746
E3	65698	193163	65295	326535	199730	326953	200139	193570
E3	92580	323198	225959	322530	225322	188096	91944	188746
E3	65698	193163	65295	326535	199730	326953	200139	193570
G3	89167	308256	223572	307198	222472	172855	88060	173880
G3	80709	189812	80588	324228	214927	324258	215078	189861
G3	89167	308256	223572	307198	222472	172855	88060	173880
G3	80709	189812	80588	324228	214927	324258	215078	189861
I3	79505	307129	213962	307537	214293	173234	79818	172783
I3	211253	294088	211400	159667	77056	159628	76941	294048
I3	79505	307129	213962	307537	214293	173234	79818	172783
I3	211253	294088	211400	159667	77056	159628	76941	294048



# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 6

A5	88080	317156	222565	316877	222411	182251	87925	182487
A5	221523	309382	221117	174931	86503	175202	86820	309653
A5	88080	317156	222565	316877	222411	182251	87925	182487
A5	221523	309382	221117	174931	86503	175202	86820	309653
C5	93483	323804	227896	323925	228048	189364	93621	189214
C5	235195	336740	235041	202298	100420	202446	100571	336874
C5	93483	323804	227896	323925	228048	189364	93621	189214
C5	235195	336740	235041	202298	100420	202446	100571	336874
E5	88230	336759	221594	336321	221132	201829	87743	202220
E5	51535	189727	52379	323101	186895	322170	186082	188800
E5	88230	336759	221594	336321	221132	201829	87743	202220
E5	51535	189727	52379	323101	186895	322170	186082	188800
G5	83282	289974	217702	290274	217925	155813	83474	155499
G5	98445	184523	98263	318938	232735	319021	232915	184573
G5	83282	289974	217702	290274	217925	155813	83474	155499
G5	98445	184523	98263	318938	232735	319021	232915	184573
I5	76941	307675	211408	307884	211533	173371	77043	173146
I5	217543	292809	217920	158358	83366	158125	83052	292563
I5	76941	307675	211408	307884	211533	173371	77043	173146
I5	217543	292809	217920	158358	83366	158125	83052	292563
A7	79632	299722	214088	299472	214074	165050	79662	165203
A7	88985	180747	88832	315170	223263	315457	223361	181000
A7	79632	299722	214088	299472	214074	165050	79662	165203
A7	88985	180747	88832	315170	223263	315457	223361	181000
C7	96040	326821	230448	327563	231308	193117	96782	192390
C7	216790	314656	216616	180230	82137	180289	82316	314776
C7	96040	326821	230448	327563	231308	193117	96782	192390
C7	216790	314656	216616	180230	82137	180289	82316	314776
E7	61179	298494	194543	297514	193656	163068	60201	164081
E7	90706	161909	90530	295269	224955	295547	225116	162077
E7	61179	298494	194543	297514	193656	163068	60201	164081
E7	90706	161909	90530	295269	224955	295547	225116	162077
G7	79630	310697	214036	311331	214687	176955	80257	176328
G7	76525	182151	78539	316535	212901	314538	210889	180122
G7	79630	310697	214036	311331	214687	176955	80257	176328
G7	76525	182151	78539	316535	212901	314538	210889	180122
I7	81537	309668	216972	309390	216712	174968	82143	175251
I7	216028	305866	216108	171426	81680	171378	81610	305943
I7	82537	309668	216972	309390	216712	174968	82143	175251
I7	216028	305866	216108	171426	81680	171378	81610	305943

# DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 6

	AB	BC	CD	DA	AC	BD
A1	134595	134439	134504	134435	190184	190221
A1	134595	134393	134490	134456	190159	190218
A1	134595	134439	134504	134435	190184	190221
A1	134595	134393	134490	134456	190159	190218

C1	134563	134377	134449	134395	190137	190134
C1	134537	134368	134454	134354	190058	190162
C1	134563	134377	134449	134395	190137	190134
C1	134537	134368	134454	134354	190058	190162

E1	133569	134359	133449	134411	189357	189505
E1	133588	134336	133449	134363	189343	189481
E1	133569	134359	133449	134411	189357	189505
E1	133588	134336	133449	134363	189343	189481

G1	134471	134320	134441	134347	189955	190171
G1	134420	134280	134414	134288	189901	190101
G1	134471	134320	134441	134347	189955	190171
G1	134420	134280	134414	134288	189901	190101

I1	134441	134282	134486	134299	189928	190148
I1	134471	134273	134424	134318	189901	190159
I1	134441	134282	134486	134299	189928	190148
I1	134471	134273	134424	134318	189901	190159

A3	134443	134445	134450	134542	190297	190041
A3	134485	134626	134486	134669	190379	190233
A3	134487	134441	134427	134511	190286	190043
A3	134443	134445	134450	134542	190297	190041

C3	134440	134430	134436	134466	190191	190071
C3	134452	134438	134443	134435	190181	190080
C3	134440	134430	134436	134466	190191	190071
C3	134452	134438	134443	134435	190181	190080

E3	133381	134436	133380	134454	189402	189363
E3	133373	134436	133384	134442	189379	189374
E3	133381	134436	133380	134454	189402	189363
E3	133373	134436	133384	134442	189379	189374

G3	134409	134348	134416	134381	190010	190098
G3	134416	134339	134397	134369	189974	190111
G3	134409	134348	134416	134381	190010	190098
G3	134416	134339	134397	134369	189974	190111

I3	134458	134303	134476	134346	189989	190140
I3	134421	134344	134420	134312	189969	190099
I3	134458	134303	134476	134346	189989	190140
I3	134421	134344	134420	134312	189969	190099

## AVERAGE LENGTHS

=====

	AB	BC	CD	DA	AC	BD
A1	134595	134416	134497	134446	190171	190220
C1	134550	134373	134452	134375	190098	190148
E1	133579	134348	133449	134387	189350	189493
G1	134446	134300	134428	134318	189928	190136
I1	134456	134278	134455	134309	189915	190153
A3	134465	134489	134453	134566	190315	190090
C3	134446	134434	134439	134450	190186	190075
E3	133377	134436	133382	134448	189390	189368
G3	134413	134343	134406	134375	189992	190104
I3	134439	134324	134448	134329	189979	190119
A5	134468	134620	134469	134686	190367	190229
C5	134428	134591	134428	134607	190238	190223
E5	133371	134506	133381	134545	189384	189489
G5	134418	134467	134450	134473	190068	190219
I5	134459	134534	134464	134510	190126	190274
A7	134440	134427	134435	134448	190248	189998
C7	134418	134464	134508	134454	190211	190102
E7	133364	134437	133464	134413	189436	189348
G7	134403	134377	134431	134375	190068	190063
I7	134438	134425	134567	134418	190110	190206

## DEVIATION FROM THE AVERAGE

=====

	AB	BC	CD	DA	AC	BD
A1	188	9	90	39	91	140
C1	143	-34	45	-32	18	68
E1	-828	-59	-958	-20	-730	-587
G1	39	-107	21	-89	-152	56
I1	49	-129	48	-98	-165	73
A3	58	82	46	159	235	10
C3	39	27	32	43	106	-5
E3	-1030	29	-1025	41	-690	-712
G3	6	-64	-1	-32	-88	24
I3	32	-83	41	-78	-101	39
A5	61	213	62	279	287	149
C5	21	184	21	200	158	143
E5	-1026	99	-1026	138	-696	-591
G5	11	50	43	66	-12	139
I5	52	127	57	103	46	194
A7	33	20	28	41	168	-82
C7	11	57	101	47	131	22
E7	-1043	30	-943	6	-644	-732
G7	-4	-30	24	-32	-12	-17
I7	31	18	160	11	30	126

DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 6

AS	134485	134626	134486	134669	190379	190233			
AS	134452	134614	134451	134703	190354	190225			
AS	134485	134626	134486	134669	190379	190233			
AS	134452	134614	134451	134703	190354	190225			
GRAPHIC DATA									
=====									
CS	134413	134561	134427	134590	190215	190202			
CS	134442	134621	134428	134624	190261	190244	C	188	39
CS	134413	134561	134427	134590	190215	190202	O	90	9
CS	134442	134621	134428	134624	190261	190244	L	58	R -32
							U	46	O -34
ES	133365	134493	133390	134540	189391	189471	M	61	W -20
ES	133377	134519	133372	134550	189377	189508	N	62	-59
ES	133365	134493	133390	134540	189391	189471		33	I -89
ES	133377	134519	133372	134550	189377	189508	A	28	-107
									-98
GS	134420	134461	134451	134475	190073	190214	C	143	
GS	134415	134472	134448	134470	190062	190224	O	45	
GS	134420	134461	134451	134475	190073	190214	L	39	
GS	134415	134472	134448	134470	190062	190224	U	32	
							M	21	
IS	134467	134513	134490	134529	190138	190285	N	21	159
IS	134452	134554	134438	134491	190114	190264		11	82
IS	134467	134513	134490	134529	190138	190285	C	101	R 43
IS	134452	134554	134438	134491	190114	190264			O 27
							C	-828	W 41
A7	134456	134422	134412	134519	190292	189996	O	-958	29
A7	134423	134431	134457	134376	190203	189999	L	-1030	3 -32
A7	134456	134422	134412	134519	190292	189996	U	-1025	-64
A7	134423	134431	134457	134376	190203	189999	M	-1036	-78
							N	-1026	-83
								-1043	
C7	134410	134449	134528	134433	190195	190101			
C7	134426	134479	134487	134474	190226	190103	E	-943	
C7	134410	134449	134528	134433	190195	190101			
C7	134426	134479	134487	134474	190226	190103	C	39	
							O	21	279
E7	133368	134449	133459	134417	189448	189347	L	6	213
E7	133360	134425	133470	134410	189425	189350	U	-1	R 200
E7	133368	134449	133459	134417	189448	189347	M	11	O 184
E7	133360	134425	133470	134410	189425	189350	N	43	W 138
								-4	99
G7	134407	134378	134431	134370	190072	190060	G	24	5 66
G7	134399	134377	134431	134379	190065	190066			60
G7	134407	134378	134431	134370	190072	190060	C	49	103
G7	134399	134377	134431	134379	190065	190066	O	48	127
							L	32	
I7	134435	134422	134563	134418	190124	190190	U	41	
I7	134440	134428	134565	134418	190096	190222	M	52	
I7	134435	134422	134563	134418	190124	190190	N	57	
I7	134440	134428	134565	134418	190096	190222		31	41
							I	160	20
									R 47

DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 6

AVERAGE OF SIDES	(corrected)	134407
	(uncorrected)	134344
AVERAGE OF DIAGONALS	(corrected)	190080
	(uncorrected)	189991

0	57
W	6
	30
7	-32
	-30
	11
	18

DIGITAL LASER PLATEMAKER ACCURACY TESTING - TEST 6

ANGLES  
=====

	A	B	C	D
A1	-0.013	-0.029	0.042	.000
C1	-0.006	-0.036	0.037	0.005
E1	0.007	-0.062	0.080	-0.024
G1	0.055	-0.063	0.070	-0.062
I1	0.065	-0.066	0.079	-0.078
A3	-0.086	0.082	-0.049	0.054
C3	-0.038	0.035	-0.028	0.031
E3	-0.008	0.010	-0.005	0.003
G3	0.026	-0.028	0.042	-0.039
I3	0.043	-0.039	0.042	-0.045
A5	-0.055	0.055	-0.027	0.027
C5	-0.008	0.008	-0.001	0.001
E5	0.026	-0.021	0.038	-0.042
G5	0.051	-0.038	0.040	-0.054
I5	0.051	-0.049	0.039	-0.041
A7	-0.081	0.079	-0.070	0.072
C7	-0.011	0.050	-0.054	0.016
E7	.000	0.043	-0.053	0.010
G7	0.005	0.007	-0.008	-0.004
I7	0.058	-0.003	.000	-0.055

**END**

**FILMED**

**3-85**

**DTIC**